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Canada

NOISE AND VIBRATION IN MINES
RESEARCH REPORTS 1972-1986

edited by G. Knight *traduit par N.R Billette*

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NOISE AND VIBRATION IN MINES RESEARCH REPORTS: 1972-1986. VOLUME 3—MINE NOISE SURVEYS Part A

BRUIT ET VIBRATION DANS MINES RAPPORTS DE RECHERCHE RELEVÉS DE BRUITS DE MINES Partie A

Edited by G. KNIGHT

Canadian Mine Technology Laboratory

Traduit par N.R. Billette

Laboratoire canadien de technologie minière

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FOREWORD

The compendium of CANMET reports on noise measurement equipment, noise assessments in mines and hearing protection assessments is a tribute to the dedication, hard work and professional expertise of Mr Savich in his field of research specialization. The research contained within the reports was accomplished by Mr. Savich or under his direction in the relatively brief period of 1972 to 1986 while working as a research scientist at the Elliot Lake Laboratory.

It is hoped that this compendium of reports on research carried out while at CANMET will be useful to those interested in finding solutions to the problems caused by miner exposure to noise and vibration.

J.E. Udd
Director
Mining Research Laboratories

AVANT-PROPOS

Le recueil de rapports de CANMET sur les instruments de mesure du bruit, les évaluations du bruit dans les mines et la protection de l'ouïe constitue un hommage à l'assiduité, le professionnalisme et l'expertise de M. Savich dans son champ de spécialisation en recherche. La recherche relatée dans ces divers rapports fut accomplie par M. Savich lui-même, ou sous sa direction, au cours de la courte période allant de 1972 à 1986, alors qu'il oeuvrait en tant que chercheur scientifique au laboratoire d'Elliot Lake.

Les Laboratoires de recherche minière de CANMET espèrent que ce recueil de rapports de recherche serviront à tous les intervenants du milieu intéressés aux problèmes reliés à l'exposition des mineurs au bruit et aux vibrations.

Directeur
Laboratoires de recherche minière
J.E. Udd

NOISE AND VIBRATION IN MINES — RESEARCH REPORTS: CANMET/ MINING RESEARCH LABORATORIES, 1972-1986.

Reprinted in 6 Volumes

Edited by

G. Knight*

French translations by

N.R. Billette*

ABSTRACT

This compendium is a reprint of all the reports on noise and vibration research undertaken by CANMET. Most of the studies were undertaken in cooperation with mines across Canada, mainly mines located in Ontario and on several occasions with the Mines Accident Prevention Association of Ontario. Two studies were carried out through the awarding of contracts.

The compendium is in 6 volumes, two of which are in parts, as follows;

1. Vol. 1–Glossary, Introduction, and Measurement Methods.
2. Vol. 2–Hearing Protection—Ear Muffs.
3. Vol. 3–Mine Noise Surveys–Part A.
4. Vol. 3–Mine Noise Surveys–Part B.
5. Vol. 3–Mine Noise Surveys–Part C.
6. Vol. 4–Mill and Surface Plant Noise Surveys–Part A.
7. Vol. 4–Mill and Surface Plant Noise Surveys–Part B.
8. Vol. 5–Noise Abatement Studies.
9. Vol. 6–Vibration Studies and General(includes unclassified)

Within each volume or section the reports are listed chronologically. The glossary has been removed from 3 of the reports and listed separately at the front. The introduction describes the main features of the contained studies in each volume.

KEYWORDS: Noise, vibration, mine surveys, noise control, hearing protection, bibliography.

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BRUIT ET VIBRATION DANS LES MINES - RAPPORTS DE RECHERCHE: LABORATOIRES DE RECHERCHE MINIÈRE DU CANMET, 1972-1986.

Réimpression (en anglais) dans 6 Volumes

édité par G. Knight*

traduit par N.R. Billette*

RÉSUMÉ

Ce recueil constitue une réimpression de tous les rapports concernant la recherche sur le bruit et les vibrations exécutée à CANMET. La plupart des travaux ont été entrepris en collaboration avec des mines canadiennes, principalement avec des mines situées en Ontario et, en de nombreuses occasions, avec l'assistance de l'Association de prévention des accidents miniers en Ontario (MAPAO). Deux recherches furent réalisées en tant que contrats.

Le recueil comprend 6 volumes, dont deux comprenant plus d'une partie, répartis comme ceci:

1. Vol. 1–Glossaire, introduction et techniques de mesure.
2. Vol. 2–Protection de l'ouïe - protecteurs supra-auriculaires.
3. Vol. 3–Relevés de bruits de mines–partie A.
4. Vol. 3–Relevés de bruits de mines–partie B.
5. Vol. 3–Relevés de bruits de mines–partie C.
6. Vol. 4–Relevés de bruits d'usines et d'ateliers de surface–partie A.
7. Vol. 4–Relevés de bruits d'usines et d'ateliers de surface–partie B.
8. Vol. 5–Études de réduction du bruit.
9. Vol. 6–Études des vibrations et divers.

Dans chaque volume ou section, les rapports sont classés en ordre chronologique. Le glossaire (en anglais seulement) provient de l'amalgamation de termes contenus dans trois des rapports et a été regroupé séparément au début. L'introduction décrit les principaux éléments des travaux contenus dans chaque volume.

MOTS-CLÉS: bruit, vibration, relevé en mine, contrôle du bruit, protection auriculaire, bibliographie.

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TABLE OF CONTENTS / TABLE DES MATIÈRES

Volume 1 Introduction and Measurement Methods
Introduction et techniques de mesure

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Glossary xiii
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Development of an anechoic chamber–72–142 13
2. Development of a standard method for testing noise exposure–73–108 35
3. A new graphical method for the evaluation of noise exposure–74–23 83
4. Noise monitor hat–74–88 119
5. Performance analysis on noise dosimeters and noise exposure monitors–75–6 139
6. Characteristics of the personal noise dose meter type 4425 as exemplified by serial no. 453311–75–23 183
7. Simple method of evaluation of the noise exposure index and the equivalent continuous sound level–75–71 207
8. Characteristics of GR–1944 noise dosimeter in the laboratory and in the field–76–83 225
9. Simple graphical method of evaluation of the noise exposure index and the equivalent continuous sound level–76–94 251
10. Tests of a noise exposure monitor helmet–77–94 267
11. A significant advance in noise monitoring instrumentation–78–62 295
12. Development of a noise monitor hat–79–40 327
13. Noise measurement in mines–80–47 365
14. Noise measurement at Denison Mines–81–54 391
15. New generation of noise dosimeters in Canadian mines–81–106 435
16. How CANMET tests noise pollution–83–56 451

Volume 2 Hearing Protection–Ear Muffs
Protection de l'ouïe–Protecteurs de supra-auriculaires

Foreword i
Avant-propos iii
Abstract v
Résumé vii

Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Effects of noise on man and hearing protection–72–140 13
2. Ear muff noise attenuation in Canadian mines–78–11 55
3. Efficiency of ear muffs in mines–78–72 227
4. Laboratory attenuation of ear muffs used in mines–78–73 287
5. Noise reduction evaluation of ear muffs–78–74 359
6. The acceptability of ear muffs–78–75 387
7. Attenuation of ear muffs in Canadian mines–78–100 427
8. Practical problems of hearing protector use in Canadian mines–80–59 493
9. Attenuation of ear muffs in mines from practice to practice
–iz prakse za prakso–82–128 523
10. Clamping force durability test–84–35 541
11. Attenuation measurement of ear muffs at Falconbridge complex:
No. 5 shaft, the East Mine and the mill and smelter, 1984–86–58 553
12. Attenuation measurements of ear muffs at Lockerby Mine, 1984–86–59 583
13. Attenuation measurements of ear muffs at Strathcona Mine, 1984–86–60 609
14. Attenuation measurements of ear muffs at Fraser Mine, 1984–86–61 643
15. Attenuation measurements of ear muffs at Falconbridge mines, 1984–86–88 671

Volume 3 Mine Noise Surveys—Part A / Relevés de bruits de mines—Partie A

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Noise measurements in Denison Mines–73–122 13
2. Preliminary noise survey at a mine-smelter complex–74–150 73
3. Noise measurement of trucks in Brunswick Mining and Smelting
No. 6 site–open pit–76–79 117
4. Noise measurements in No. 12 mine, Brunswick Mining and Smelting–77–36 ... 151
5. Noise measurements in Quirke No. 2 mine, Rio Algom–80–26 325
6. Noise measurement of auxiliary fans at Stanleigh Uranium Mine–82–78 373

Volume 3 Mine Noise Surveys—Part B / Relevés de bruits de mines—Partie B

Table of Contents / Table des matières i
7. Measurement of noise exposure index of underground service workers at
Denison Mines–82–142 401

8. Measurement of noise exposure index of operators on haulage equipment from the underground operations at Denison Mines–82–143 615
9. Noise measurement on underground crushing equipment at Denison Mines–82–144 747

Volume 3 Mine Noise Surveys—Part C / Relevés de bruit de mines—Partie C

Table of Contents / Table des matières i
10. Measurement of noise exposure index of miners at drilling operations at Denison Mines–82–145 883
11. Short noise measurements on fans at Fraser and Strathcona mines–83–114..... 1245
12. Measurement of impulse noise of vehicles at the Stanleigh Uranium mine–84–83 1261
13. Personal noise dosimetry survey of various occupational groups at four Potash mines in Saskatchewan–86–122..... 1295

Volume 4 Mill and Surface Plant Noise Surveys—Part A
Relevés de bruits d'usines et atelier de surface—Partie A

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Noise measurement in the concentrator at Brunswick Mining and Smelting–76–91. 13
2. Noise measurement in the crushing and screening plant at Denison Mines–81–50. 109
3. Noise measurement in grinding plant and coarse ore storage at Denison Mines–81–51 147
4. Noise measurement on surface maintenance locations at Denison Mines–81–52 .. 251

Volume 4 Mill and Surface Plant Noise Surveys—Part B
Relevés de bruits d'usines et ateliers de surface—Partie B

Table of Contents / Table des matières i
5. Noise measurement in assay laboratory at Denison Mines–81–53..... 487
6. Noise measurement in the hydrometallurgical plant at Denison Mines–81–95..... 571
7. Noise measurement at shafts No. 1 and No. 2 at Denison Mines–83–45..... 893
8. Problems and solution of environmental noise at Indusmin–84–54..... 915

Volume 5 Noise Abatement / Études de réduction du bruit

Foreword i
Avant-propos iii
Abstract v

Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Production, characteristics and abatement of noise from light and medium rock drills–73–157 13
2. Noise attenuation in rock drills–75–39 71
3. Canada is one of the leading nations in noise abatement in mines–78–10 115
4. Diamond drill noise study: phase I–9–9023 139
5. Diamond drill noise study: phase II–0–9044 219
6. Abatement of noise and vibration in the Canadian mining industry–82–40 281
7. Cost effectiveness and technical feasibility of options available for sound-proofing diamond drilling equipment: phase III–1–9045 321
8. Noise attenuation with exhaust after treatment systems on a scooptram at Falconbridge's Strathcona mine–84–65 401
9. Practical work on the noise attenuation with exhaust after treatment systems on a ST4A scooptram–84–69 433

Volume 6 Vibration Studies and General / Études des vibrations et divers

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
Vibration Studies / Études des vibrations
1. A study of vibration sources affecting mine workers–1–9133 13
General and Unclassified / Divers
2. Noise and vibration in Canadian mines–73–17 155
3. Introduction to noise measurement–73–40 363
4. Measurement and control of noise in Canadian mines: a review and progress report–74–76 397
5. An acoustical method for source location of methane–80–57 433
6. Combustion-noise and vibration research projects–82–66 445
7. Looking ten years backward and ten years forward at the battle against noise and vibration in Canadian mines–83–28 475
8. Heliport at Sudbury hospital–83–61 491

INTRODUCTION

This research was undertaken because noise-induced hearing loss is a substantial problem in the mining industry and because vibration-induced damage occurs to blood capillaries in the hands of miners, particularly drillers. Noise-induced hearing loss generally occurs over a long period of time. Because humans are adaptable and tend to compensate for the gradual loss, the impairment goes unrecognized for a long time. Exposure to very loud noises, such as explosions, can give rise to immediate and disabling damage to the hearing system.

Hearing impairment affects both employees and employers. Compensation payments are becoming substantial. The hearing loss can only be detected in the early stages by frequent checks of hearing acuity and this is now required for miners in most Canadian jurisdictions.

Noise is measured as the peak to trough pressure difference in the vibration waves in air. The results are expressed in relative terms to the hearing sensitivity of (young adult) humans in good health using a logarithmic scale to the base 10. Thus, an increase of one Bel is equivalent to a ten times stronger noise level. However, the Bel is a large unit and it is more convenient to use a unit ten times smaller, the decibel. Hearing acuity is frequency dependent. It peaks at a frequency of about 1 000 Hertz (cycles per second) and falls off to the extreme limits, roughly 20 and 20 000 Hz. Sound measurement equipment is much less frequency dependent and a weighting factor is used to relate it to human hearing. The "A"-scale is used in hearing loss programs generally. Thus, the weighted noise level in decibels is usually abbreviated as dBA. Hearing loss is believed to occur when exposure is above a threshold level, 85 dBA and 90 dBA have been specified in various jurisdictions. The hearing loss is proportional to the height of the noise excursion and its duration. Three factors are in use for equating the potential hearing loss to the noise level:

1. A doubling every 3 dBA–The equal energy principle, used in many hearing loss control recommendations.
2. A doubling every 4 dBA–used in one or more recommendations.
3. A doubling every 5 dBA–used in the principal USA legislation: the Occupational Safety and Health Act (OSHA).

Canadian regulations are set provincially and federally: either factor 1 or 3 is used.

In addition to potential hearing losses high noise levels lead to problems in safety, fatigue and communication.

Most of the noise studies have been directed at surveys of noise in mines and the efficacy of hearing protection measures. The mine surveys have shown that many miners

are exposed to noise levels above the threshhold for potential hearing loss and that immediate hearing protection is required as well as an effort to reduce the noise level of mining machinery.

This compendium is a reprint of all the reports on noise and vibration research undertaken by CANMET. Most of the studies were undertaken in cooperation with mines across Canada, mainly mines located in Ontario and, on several occasions, with the Mines Accident Prevention Association of Ontario. Two studies were carried out through the awarding of contracts. A few of the early reports by Miron Savich were based on his MSc. thesis work undertaken at the Institute of Mineral Research of McGill University, situated at Mont St. Hilaire, Quebec.

The compendium is in 6 volumes, two of which are in parts, as follows;

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5. Vol. 3–Mine Noise Surveys–Part C.
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Within each volume or section the reports are listed chronologically. The glossary has been removed from 3 of the reports and amalgamated. It is presented separately at the front, following the contents table.

The noise measurement methods used are described in some reports in the first volume as well as being described in many of the other reports on surveys etc.. Five main classes of noise measurement techniques have been used in the noise surveys. These are:

1. Hand-held meters with "A"-scale weighting and slow response time averaging over a short period of time, a second or less, with manual recording. This was used in the earlier surveys and occasionally later. A graphical method of determining the average noise level for the survey is given in report 75–71.
2. The hand-held sound level meter was also used in the peak measurement mode for studies of impulse, or short duration, noise as in report 84–83.

3. A shift length recording system in which the average noise level over a period, such as a minute, is stored on a memory bank and read out later. In the system used, the results were read at the end of the shift and analysed using a computer program as described in report 78–62.

4. The noise dosimeter averages noise level over a short period of time and, if it exceeds the threshhold, adds it up using an appropriate factor to give the noise level as a ratio of the exceedance to permissible for the shift. The instrument usually has an indicator for showing whether the noise level has exceeded the ceiling level of 115dBA promulgated in the OSHA regulations (presumably intended for unprotected ears). This instrument has been used in many surveys and tests on hearing protectors. One unit was described and tested in report 76–83.

5. Frequency analysis sound level meter. This determines the sound level in each band of frequency of significance, usually one third octave wide. The equipment is desirable because the attenuation of noise by any barrier is frequency dependent and because the frequency of an offensive sound may be very helpful in determining its source. Ear muffs are sound attenuators and therefore frequency dependent, they are not as good attenuators at low frequencies as at high frequencies.

Ear muffs (hearing protectors) were shown to be highly efficient in laboratory tests providing attenuations of 31 to 44 dBA at frequencies of 1 000 Hz and above. Safety glass-frames passing under the seal of the ear muff, however, were found to reduce attenuations to 25 to 34 dBA. The wearing of safety glasses is obligatory in most working places in the mining industry. Field studies in mines showed that the effective protection factors for ear muffs could be less than 10 dBA. The surveys carried out at Falconbridge Mines Ltd., Reports 86–58, 86–59, 86–60, 86–61 with a final summary in 86–88 illustrate the value of such studies. The attenuations of ear muffs found in mines are shown in Figure 1, where the measured attenuation(OSHA basis) in dBA is shown plotted against the mean sound level in dBA (variously described in the reports as $L_{eq}(60s)$; L_{OSHA} or $L_{Avg.}$). The required attenuation line is drawn assuming that the average sound levels persist for a full 8 hour shift and that ear plugs are not worn. This figure suggests that about half of the population examined were not protected to the extent required. However, neither of these assumptions are true and it is probable that substantially more than the half of the population was protected to the extent required. The major reason for the poor performance of ear muffs in practise was found to be poor fitting, the spring clamping force was often inadequate, particularly on small headed individuals. Emphasis was placed on the measurement and control of clamping force and the

need to fit earmuff supports to head size. On the basis of these surveys recommendations were made to improve control of hearing protection programs.

The noise surveys are a useful repository of information. The detailed surveys, using the data logging technique, which form the major part of volumes 3 and 4, provide invaluable information to those planning noise control programs in many mining operations. Nearly 700 man-days were logged in the detailed surveys. It could be seen that the distribution of noise exposure during the shift varies from nearly constant to highly variable. In the mines 262 shifts out of the 432 recorded were worked at sound levels above permissible exposure. The highest values were about 40 times greater requiring hearing protection of at least 28 dBA attenuation. This would be even higher if the proposed OSHA standards instead of the existing rules (at the time the reports were written) were used as the basis for assessment. In the mills and surface plants only 13 out of the 250 shifts recorded were worked at sound levels above permissible exposure. The highest value required about 10 dBA attenuation in the hearing protection.

Noise control studies have been carried out with respect to light and medium weight percussion rockdrills, diamond drills and diesel engine exhaust systems. The diamond drill studies point out the need for a thorough investigation of all the noise sources, four major sources have been identified. Reduction of only one source would, as a result, produce almost no effect on sound level, a reduction of about 1 dBA. It may, however, modify the sound quality significantly.

The high noise levels measured in mining emphasize the requirement for substantial work to control noise on mining machinery. It is likely that eventually it will be desirable not to expose men to sound levels over 85 dBA and that the necessity for hearing protection will be considered an undesirable working condition to be eliminated.

The contract study on vibration found that stopers and jackleg drills subjected miner's hands to vibration levels sufficient to induce vibration white finger disease in periods of one to four years in over half the population. It was also shown that vibration isolators could be effective in substantially reducing vibration transmission to hands and proposed that vibration isolation handles should be developed and used on percussion drills. Some sites where whole-body exposure to vibration exceeded guidelines were found in surface plant and mills. Underground diesel powered vehicles were not examined.

The report 73–17 in the miscellaneous section in volume 6 is a good exposition of the noise and vibration problems in mines. The topics covered include noise and vibration measurement; noise and vibration exposure standards; and noise and vibration sources; as well as control methods.

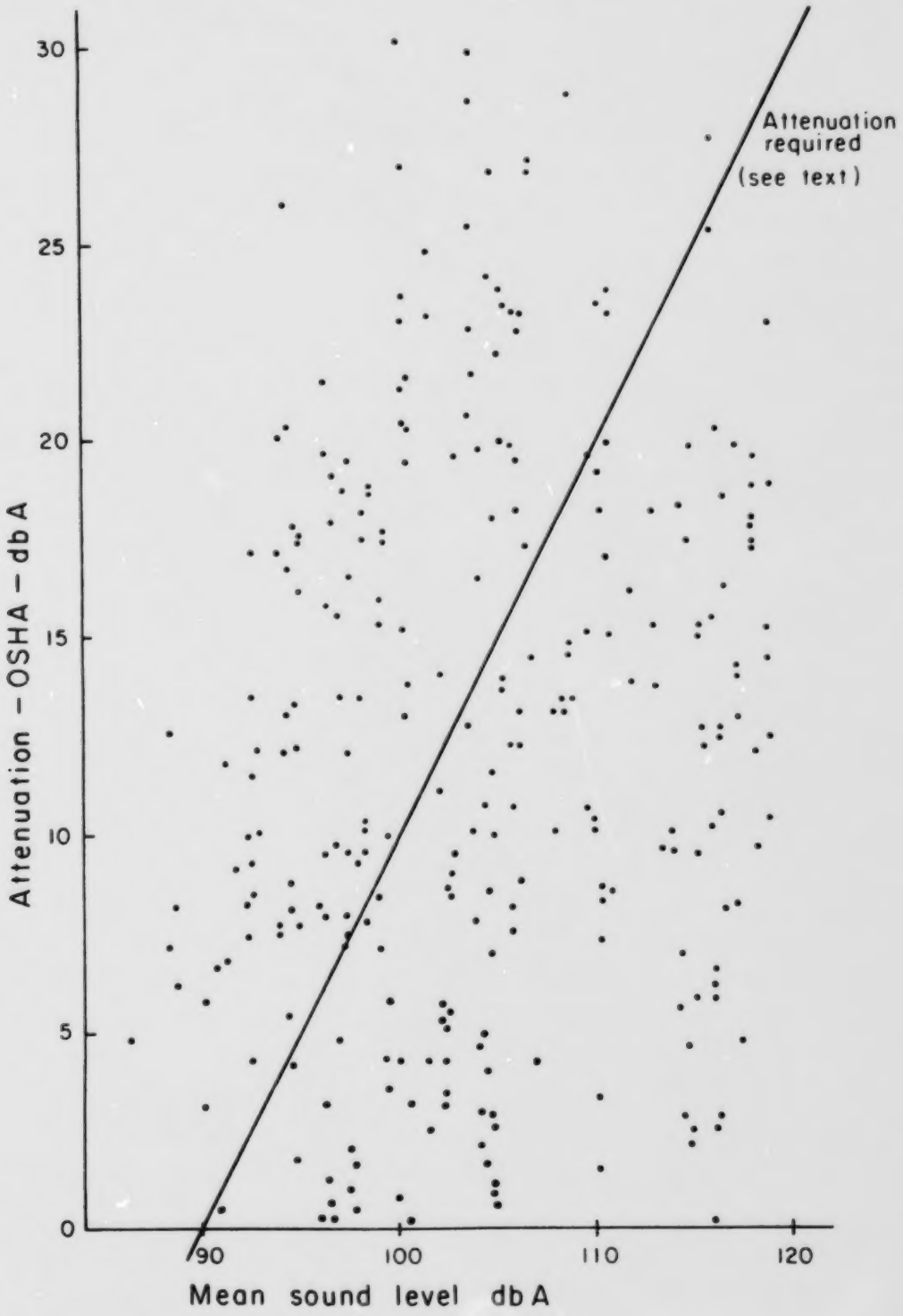

Fig. 1–The attenuation of ear muffs measured in use in mines.

Fig. 1–L'atténuation des protecteurs supra-auriculaires en usage dans le mines

It should be appreciated that many of the reports cover more than one topic and that they have not been cross-referenced. They are entered in the category corresponding to the major aspect studied.

The report pages have not been renumbered. To assist in locating each report red coloured pages are used to separate them. Each of these has page and report numbers in the top right hand corner and the full title and description of the report and its publication details, if other than a divisional report.

The reports are in their original language, usually english. The abstracts have been translated into french and are given at the front of each report.

ACKNOWLEDGEMENTS

The editor wishes to thank his colleagues in the Mining Research Laboratories for assistance in gathering and compiling these reports.

INTRODUCTION

Ces travaux de recherche ont été entrepris parce que la perte auditive due au bruit constitue un problème important dans l'industrie minière, ainsi qu'à cause des dommages aux capillaires sanguins induits par vibration aux mains des mineurs, et plus particulièrement des foreurs. La perte auditive due au bruit découle d'une exposition prolongée. Puisque les humains s'adaptent facilement et tendent à compenser la perte graduelle, la détérioration passe longtemps inaperçue. Toutefois, l'exposition à de très grands bruits, une explosion par exemple, peut entraîner un dommage immédiat incapacitant du système auditif.

La perte auditive affecte tant l'employeur que l'employé. Les paiements compensateurs sont devenus substantiels. Les premiers signes de dégradation de l'ouïe ne sont reconnus qu'au prix de multiples vérifications de l'acuité auditive, ce qui est maintenant exigé dans la plupart des juridictions canadiennes concernant les mineurs.

Le bruit est mesuré comme différence entre le sommet et le creux des ondes vibratoires dans l'air. Les résultats sont exprimés en termes relatifs à la sensitivité auditive d'un humain (jeune adulte) en bonne santé, en utilisant une échelle logarithme de base 10. Ainsi, une augmentation du niveau sonore d'un Bel équivaut à décupler l'énergie acoustique. Toutefois, le Bel constitue une unité représentant une somme énergétique importante, de sorte qu'il est plus approprié d'utiliser le décibel, une unité dix fois plus petite. L'acuité auditive dépend de la fréquence de l'onde. Elle atteint son maximum aux alentours de la fréquence de 1,000 Hertz (cycles par seconde) et diminue aux deux extrémités du spectre, soit 20 et 20,000 Hz respectivement. L'équipement de mesure du son est beaucoup moins dépendant de la fréquence utilisée, de sorte qu'un facteur de pondération est nécessaire pour relier le niveau sonore à l'acuité auditive humaine. L'échelle "A" est généralement utilisée dans les programmes de perte auditive. Dans ce cas, le niveau sonore pondéré est habituellement abrégé à dBA. La perte auditive est considérée se produire au-delà d'un seuil, 85 dBA et 90 dBA étant la norme dans diverses réglementations. La perte auditive est proportionnelle à la puissance de l'onde sonore et à la durée de l'exposition. Trois facteurs légaux sont utilisés pour établir la relation entre dommage potentiel et niveau sonore:

1. Le dommage double tous les 3 dBA – le principe d'énergie équivalente, à la base de nombreuses recommendations du contrôle de la perte auditive.
2. Le dommage double tous les 4 dBA – utilisé dans une recommendation ou plus.
3. Le dommage double tous les 5 dBA – en usage dans la principàles législation américaine, l'Acte de santé et sécurité occupationnelles (OSHA).

Les réglementations canadiennes sont émises aux niveaux provinciaux et fédéral: elles utilisent le facteur 1 ou le facteur 3.

En plus des pertes auditives potentielles, les niveaux sonores élevés entraînent des problèmes de sécurité, de fatigue et de communications.

La plupart des travaux sur le bruit ont été orientés vers des relevés du bruit dans les mines et vers l'appréciation de l'efficacité des mesures de protection de l'ouïe. Les relevés dans les mines ont démontré que plusieurs mineurs sont exposés à des niveaux sonores supérieurs au seuil de dommage auditif potentiel et qu'une protection immédiate de l'ouïe est nécessaire en parallèle à l'implantation de mesures de réduction du bruit de l'équipement et matériel minier.

Ce recueil incorpore tous les rapports de recherche sur le bruit et les vibrations réalisés par CANMET. La plupart des travaux ont été réalisés en collaboration avec des mines canadiennes, principalement avec des mines situées en Ontario et, à maintes reprises, avec l'assistance de l'Association de prévention des accidents miniers en Ontario (MAPAO). Deux recherches furent réalisées sur une base contractuelle. Quelques uns des premiers rapports de Miron Savich étaient basés sur sa thèse de maîtrise réalisée à l'Institut de Recherche minérale de l'Université McGill, situé à St-Hilaire, Québec.

Le recueil comprend six volumes, dont deux en plusieurs parties, comme suit:

1. Vol. 1–Glossaire, introduction et techniques de mesure.
2. Vol. 2–Protection de l'ouïe - protecteurs supra-auriculaires.
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Dans chaque volume ou section, les rapports sont classés en ordre chronologique. Le glossaire (en anglais seulement) provient de l'amalgamation de termes contenus dans trois des rapports. Il est présentement à part au début, tout de suite après la table des matières.

Les techniques de mesure du bruit utilisées sont décrites dans quelques rapports du premier volume, ainsi que dans de nombreux autres reliés aux relevés de mines, usines et

ateliers. Cinq classes principales de techniques de mesure du bruit ont été expériementées dans les relevés sonores. Ce sont:

1. Des appareils manuels pondérant les fréquences selon l'échelle "A", avec un temps de réponse assez lent et le calcul de la valeur moyenne sur une brève période, une seconde ou moins, et enregistrement manuel du résultat. Il s'agit de la technique utilisée lors des premiers relevés, puis occasionnellement par la suite. Une méthode graphique pour déterminer le niveau acoustique pondéré au cours du relevé est expliquée dans le rapporté 75-71.

2. Le sonomètre manuel a aussi été utilisé en mode de mesure des bruits d'impact pour des études d'impulsion, ou bruit de courte durée, comme dans le rapport 84-83.

3. Un système d'enregistrement pour la période de travail (8 heures), qui cumule le bruit moyen d'une période de courte durée, une minute par exemple, et la conserve en mémoire pour lecture ultérieure. Le système utilisé permettait la lecture de l'information à la fin de la période de travail et son traitement ultérieur informatisé, tel que décrit dans le rapport 78-62.

4. L'audio-dosimètre calcule le niveau sonore moyen sur une courte période de temps et, surtout s'il excède le niveau légal, calcule le rapport du niveau sonore obtenu au niveau permis pour la période de travail. L'instrument possède également un voyant lumineux qui indique un dépassement de la limite légale absolue de 115 dBA promulguée dans les règlements OSHA (sans aucun doute pour une ouïe sans protecteur). Cet instrument a été utilisé dans plusieurs relevés et lors de tests concernant les protecteurs auriculaires. Un tel appareil a été décrit et vérifié dans le rapport 76-83.

5. Le sonomètre d'analyse fréquentielle. Cet instrument mesure le niveau acoustique moyen dans chaque bande de fréquence significative, habituellement de la largeur d'un tiers d'octave. L'instrument est nettement recommandable, puisque l'atténuation du bruit par toute barrière est fonction de la fréquence et parce que la fréquence d'un son agresseur contribue à localiser sa source. Les protecteurs auriculaires sont des atténuateurs de son et, de ce fait, dépendent de la fréquence d'émission. Ils n'atténuent pas les basses fréquences avec autant de bonheur que les hautes fréquences.

Les protecteurs supra-auriculaires ont démontré des habiletés d'atténuation allant de 31 à 44 dBA en laboratoire pour les fréquences de 1,000 Hz et plus. Les montures de lunettes de sécurité passées sous les coussins du protecteur réduisent cependant la protection qui passe alors de 25 à 34 dBA. Comme le port de lunettes protectrices est obligatoire pour la plupart

des postes de travail dans l'industrie minière, des études sur le terrain dans les mines ont démontré que la protection réelle obtenue par des protecteurs supra-auriculaires peut ne pas dépasser 10 dBA. Les relevés effectués à Falconbridge Ltée, rapports 86-58, 86-59, 86-60, 86-61 avec un résumé final dans 86-88, illustrent la validité de tels travaux. La figure 1 (voir page 5) illustre l'atténuation en dBA (base OSHA) des protecteurs supra-auriculaires en usage dans les mines, où cette dernière est comparée au niveau acoustique pondéré en dBA (décrit différemment dans les rapports comme $L_{eq(60s)}$; L_{OSHA} ou $L_{Avg.}$). La ligne d'atténuation requise est illustrée en assumant que les niveaux acoustiques moyens persistent tout au long de la période de 8 heures et que des bouchons d'oreilles ne sont pas utilisés. Cette figure suggère que la moitié de la population des mineurs n'est pas protégée au niveau légal requis. Toutefois, aucune de ces deux hypothèses n'est vraie et il est fort probable qu'une proportion largement supérieure à la moitié se trouve protégée au niveau requis. La principale raison de la faible performance des protecteurs supra-auriculaires en pratique découle d'un mauvais ajustement, la force du ressort étant souvent inadéquate, principalement chez les individus ayant un faible tour de tête. L'emphase a été mise sur la mesure et le contrôle de la force de serre et le besoin d'ajuster les supports des protecteurs au tour de tête. Des recommendations basées sur ces relevés ont donc été faites, afin d'améliorer les programmes de contrôle pour la protection de l'ouïe.

Les relevés sonores constituent un recueil d'informations. Les relevés détaillés, utilisant la technique d'enregistrement des données, constituent l'essentiel des volumes 3 et 4, et contiennent de l'information précieuse pour tous ceux qui entreprennent des programmes de contrôle du bruit dans des opérations minières. Près de 700 jours-hommes ont été enregistrés lors des relevés détaillés. Il est ainsi possible de constater que la distribution d'exposition des mineurs au bruit varie, au cours de la période de travail, de presque constante à très variable. Dans les mines, 262 des 432 périodes de travail enregistrées l'ont été à l'aide de l'audio-dosimètre en niveau relatif à l'exposition permise. Les valeurs les plus fortes indiquaient un dépassement du seuil de 40 fois, signifiant une protection de l'ouïe de l'ordre de 28 dBA d'atténuation. Cette atténuation serait encore supérieure si les nouveaux standards proposés par OSHA étaient utilisés comme base au lieu des règles actuelles (au moment où les rapports étaient rédigés). Dans les usines et ateliers de surface, seulement 13 des 250 périodes de travail enregistrées l'ont été à l'aide de l'audio-sonomètre. La valeur la plus forte requerrait une atténuation de l'ordre de 10 dBA pour assurer la protection légale de l'ouïe.

Les travaux de contrôle du bruit ont été entrepris sur des foreuses à percussion de poids léger à moyen, sur les foreuses à diamant et sur les systèmes d'échappement des moteurs diesels. Les études sur les foreuses à diamant ont démontré un besoin d'investigation approfondie de toutes les sources de bruit, quatre sources majeures ayant été identifiées. La réduction d'une seule source résulterait en une atténuation à peine discernable du niveau

acoustique moyen, à savoir 1 dBA. Elle pourrait cependant modifier la qualité sonore de façon appréciable.

Les niveaux sonores élevés mesurés dans les mines mettent l'emphase sur le besoin de travaux importants, afin de réduire le bruit du matériel minier. Il est probable qu'il faudra éventuellement limiter l'exposition des travailleurs à des bruits n'excédant pas 85 dBA et que l'usage de protecteurs auriculaires devienne une condition de travail indésirable, à éliminer.

L'étude contractuelle sur les vibrations a démontré que les foreuses manuelles verticales et sur béquille exposaient le mineur à des niveaux vibratoires suffisants pour induire le phénomène de Raynaud (insensibilité de la main) chez plus de la moitié de la population sur une période allant de 1 à 4 ans. Elle a aussi permis de démontrer que les isolants vibratoires permettent de réduire la transmission des vibrations à la main et suggéré de développer des poignées isolant les vibrations et de les adapter aux foreuses à percussion. Ces relevés ont aussi identifié des sites où les vibrations corporelles excédaient les directives dans les usines et ateliers de surface. Les véhicles souterrains à moteur diesel ne furent pas examinés.

Le rapport 73-17, dans la section "divers" du volume 6 expose bien les problèmes de bruit et vibrations dans les mines. Les sujets abordés sont la mesure du bruit et des vibrations, les standards d'exposition au bruit et aux vibrations, les sources de bruit et de vibrations, et les méthodes de contrôle.

Il faut enfin mentionner que plusieurs des rapports couvrent plus d'un sujet et qu'ils n'ont pas de renvoi mutuel. Ils sont inclus dans le manuel qui correspond au principal aspect étudié.

Les pages des rapports n'ont pas été renumérotées. Pour mieux localiser chaque rapport, une page rouge est insérée au début de chacun. Chaque rapport est numéroté dans le coin supérieur droit et contient, en plus, son titre propre et la description du contenu, ainsi que son lieu d'édition lorsqu'il ne s'agit pas d'un rapport divisionnel. Un résumé français est compris avec chaque rapport.

73-122 M. Savich

Noise measurements in Denison Mines

1973

MESURE DU BRUIT À LA DENISON MINES LTD.

M.U. Savich*

RÉSUMÉ

Des mesures de l'exposition au bruit ont été effectuées à la Denison Mines Ltd. On a mesuré les niveaux de bruit en appliquant la méthode normalisée dans laquelle un sonomètre est utilisé avec le réseau de pondération A et réglé sur la réponse lente. Les normes sur l'exposition au bruit prescrites par la Walsh-Healey Public Contracts Act ont été appliquées dans l'analyse des résultats.

Les mesures de l'exposition au bruit ont été effectuées dans la mine sur les machines qui produisent le plus de bruit : concasseur, matériel de débitage, marteau perforateur, perforatrice d'avancement et jumbo à trois bras. De plus, on a mesuré le niveau de bruit des ventilateurs et des systèmes de ventilation, de même que du matériel de roulage. On a aussi effectué des mesures dans d'autres environnements miniers.

Les résultats des mesures ont montré que les niveaux de bruit étaient très élevés et que de nombreux travailleurs étaient surexposés. D'après l'analyse des résultats obtenus, l'évaluation de l'exposition au bruit à la Denison Mines Ltd. pourrait être effectuée par simulation.

Bruit; mesure; instrument; mines; simulation

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NOISE MEASUREMENTS IN DENISON MINES

by

M. Savich*

ABSTRACT

Noise exposure measurements were performed in Denison Mines. The standard method for testing noise exposure with a sound level meter operating on the A-weighting network with slow meter response was used to observe the sound levels. The standards on noise exposure prescribed under the Walsh-Healey Public Contracts Act was applied in the analysis of results.

The noise exposure test was performed on the machines in the mine which produce the most noise: crusher, breaker, hammer drill, drifter, and three-boom jumbo drill. Also, the noise level was observed of fans and ventilation systems, of haulage equipment, and in other mining environmental areas.

The results of the measurements showed very high noise levels and that many men were overexposed. On the basis of the analysis of the results obtained, the evaluation of noise exposure in Denison Mines could be performed by simulation.

Noise: Measurement: Instrument: Mines: Simulation

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CONTENTS

Abstract ---------- i

1. Introduction 1
   - 1.1 Hearing Loss from Noise Exposure ---------- 1
   - 1.2 Noise Safety Criteria ---------- 2
   - 1.3 Standards for Noise Exposure Measurements ---------- 3
2. Field Measurements: Equipment and Technique
   - 2.1 Instruments ---------- 9
     - 2.1.1 Sound Level Meter ---------- 9
     - 2.1.2 Noise Exposure Monitor or Dosimeter ---------- 10
   - 2.2 Technique for Analysis of Results ---------- 19
3. Noise Measurement at Denison Mines ---------- 20
   - 3.1 Underground Labor Distribution ---------- 20
   - 3.2 Noise Levels from Lockers to Beat ---------- 22
   - 3.3 Noise Levels of Fans and Ventilation Systems ---------- 24
   - 3.4 Noise Levels of Haulage Equipment ---------- 27
   - 3.5 Main Machinery Noise Levels ---------- 30
     - 3.5.1 Crusher ---------- 30
     - 3.5.2 Breaker ---------- 33
     - 3.5.3 Hammer Drill ---------- 36
     - 3.5.4 Drifter ---------- 36
     - 3.5.5 Jumbo Drill ---------- 42
4. Simulation of Noise Exposure in Mines ---------- 45
5. Conclusions ---------- 47
6. Acknowledgements ---------- 49
7. References ---------- 50

FIGURES

1.	Mean Audiogram of Employees Exposed to Industrial Noise	1
2.	The Relationship between Sound Level and Duration for the Walsh-Healey Act and ISO Recommendation R1999 Proposal	4
3.	Equivalent A-Weighted Sound Levels	6
4.	Block Diagram of Basic Instrumentation for the Measurement of Noise and Vibration	8
5.	Components of a Noise Dose Measurement	10
6.	Functional Block Diagram of the Noise Dosimeter (B and K Type 4423) Showing Measurement Set-Up Including Sound Level Meter and Analysis of Noise Dose	13
7.	Computing Noise Monitor (B and K Model 160) Designed for Portable or Table-Top Operation	15
8.	The 166 Environmental Noise Classifier	16
9.	The Sound Level Meter with Seams Taped to Protect Interior from Dust and Water	19
10.	Mine Layout and Noise Sampling Locations in Denison Mines Limited, Elliot Lake	21
11.	Ventilation Layout in Denison Mines Limited, Elliot Lake	25
12.	The Test Site Used for the Moving Vehicle on Panel 24	27
13.	Crusher Operator Exposure Histogram (05/02/73)	31
14.	Distribution of A-Weighted Sound Levels of Crusher Noises Sorted into Groups of Duration Times (05/02/73)	31
15.	Crusher Operator Exposure Histogram (13/02/73)	32
16.	Distribution of A-Weighted Sound Levels of Crusher Noises Sorted into Groups of Duration Times (13/02/73)	32
17.	The Moderately Asymmetrical Frequency Curves of Operation Durations of Crushers	33
18.	Breaker Operator Exposure Histogram	34
19.	Distribution of A-Weighted Sound Levels of Breaker Noises Sorted into Groups of Duration Times	34
20.	The Moderately Asymmetrical Frequency Curve of Operation Durations of the Breaker	35
21.	Hammer Drill Operator Exposure Histogram	37
22.	Distribution of A-Weighted Sound Levels of Hammer Drill Noises Sorted into Groups of Duration Times	37
23.	The Moderately Asymmetrical Frequency Curve of Operations of the Hammer Drill	38
24.	Drifter Operator Exposure Histogram (08/02/73)	39
25.	Distribution of A-Weighted Sound Levels of Drifter Noises Sorted into Groups of Duration Times	39

26. Drifter Operator Exposure Histogram (12/02/73) ---------- 40
27. Distribution of A-Weighted Sound Levels of Drifter Noises Sorted into Groups of Duration Times ---------- 40
28. The Moderately Asymmetrical Frequency Curves of Operation Durations of Drifters ---------- 41
29. Jumbo Drill Operator Exposure Histogram ---------- 43
30. Distribution of A-Weighted Sound Levels of Jumbo Drill Noises Sorted into Groups of Duration Times ---------- 43
31. The Moderately Asymmetrical Frequency Curve of Operation Durations of the Jumbo Drill ---------- 44
32. "Peut-on, à l'heure actuelle, entreprendre une analyse d'optimisation valable des mécanismes de l'exploitation minière (au moyen de programmations linéaires ou mathématiques)" (23)? ---------- 46

TABLES

1. Permissible Noise Exposures ---------- 5
2. Noise Dosimeters - Competitors ---------- 18
3. Noise Levels between Lockers and Beat Area in Denison Mines, Elliot Lake ---------- 23
4. Sound Pressure Levels of Fans in Denison Mines ---------- 26
5. Noise Levels of Haulage Equipment in Denison Mines, Elliot Lake ---------- 28
6. Noise Levels of the Moving Vehicle on Panel 24, Denison Mines, Elliot Lake ---------- 29
7. Cumulative Distribution of A-Weighted Sound Levels of the Typical Machines in Denison Mines, Elliot Lake -------- 48

1. INTRODUCTION

In industrial society, noise pollution is becoming more of a problem as noise levels increase. Hearing loss may result from exposure to a noisy work environment. Noise measurement in mines is directed toward the following objectives:

- estimation of the noise to which miners are exposed;
- control of noise sources "in situ";
- audiometric examination of miners subjected to prolonged exposure to high noise levels.

1.1 Hearing Loss from Noise Exposure

Occupational deafness is irreversible hearing loss (the permanent threshold shift - PTS). Hearing loss for a given sound is the difference in decibels between the hearing threshold for that sound and the threshold of hearing. Audiometric testing of miners who have been subjected to prolonged exposure to high noise levels will reveal enfeeblement of hearing acuity in the higher frequency ranges between 3000 and 6000 Hz (1).

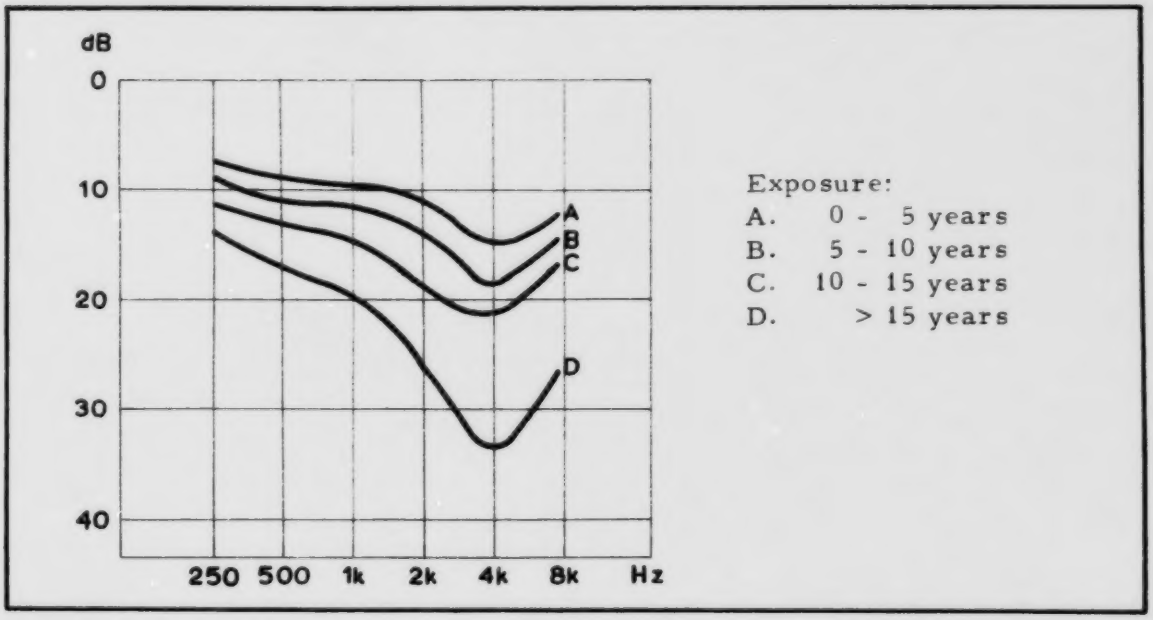

Figure 1: Mean Audiogram of Employees Exposed to Industrial Noise (1).

A noise-induced hearing loss initially damages the sensitive hair cells in the organ of the Corti, causing a loss of acuity at 4000 Hz, and abbreviated as the C^6 dip (C^5 on the musical scale has a frequency of 4096 Hz). If a person's ability to hear conversational speech has not been affected, the hearing loss goes undetected in its temporary stage (the temporary threshold shift - TTS). These two types of hearing loss have many gradations between them. In evaluating noise-induced hearing loss, the PTS should be measured after recovery of TTS, and PTS should be measured after termination of exposure, or before work commences.

A noise-induced hearing loss generally affects both ears in persons under 40 years of age. Some individuals seem more sensitive to loud sound than others (2). When examining the hearing of a mining or industrial community, the various non-occupational causes of hearing loss, in particular infection, during intoxication and presbycosis, should be kept in mind.

1.2 Hearing Loss Criteria

Mining (industrial) noises are a complex mixture of several notes having their individual frequencies, intensities, and distribution in time. The different types of noise are:

a) continually wide-band noise, i.e. noise including a wide range of frequencies, e.g. general mining or machine shop noise;

b) continually narrow-band noise, i.e. the sound energy is concentrated in a few frequencies, e.g. drill hammers and circular saws;

c) impact or impulse noise, i.e. short duration impulses, e.g. tapping and hammering (the noise is a change in sound pressure level of 40 dB or more within 0.5 seconds;

d) steady-state (continuous) repeated impact noise where a change in sound pressure level is less than 40 dB between successive 0.5 sec intervals, e.g. rivetting and breaking;

e) intermittent noise where there are several periods of steady-state noise with intervals of ambient noise, e.g. traffic and drilling noise.

Using time and level as the measure, there are four classes into which occupational noise exposures may be grouped (3):

1. long-term continuous noise,
2. short-term continuous noise,
3. intermittent equal-intensity noise, and
4. intermittent variable-intensity noise.

Long-term continuous noise is defined as noise of a constant level and spectrum to which a listener is exposed for 6 to 8 hours per day, 40 hours per week, 50 weeks per year. Most criteria are written for this type of operator exposure noise.

Short-term continuous noise is defined as broad-band noise at a constant level for less than 5 hours per day, 5 days per week, for life. The octave bands 500, 1000, and 2000 Hz are considered, because these bands are of importance in the protection of hearing for speech.

Intermittent equal noise exposure is defined as exposure time to a given broad-band pressure-level times per day during a normal working day.

Intermittent variable noise is defined as broad-band noise which is intermittent in time duration and variable in both duration of "on" and "off" time and absolute magnitude. Two basic methods are currently available. The equal-energy theory (4) reasons that hearing-damage risk is determined by the total amount of energy for each day (8 hr). For half-day exposure (4 hr), 3 dB greater noise levels are permissible for the same risk. Each halving of energy permits adding 3 dB to the noise levels permissible. The equal temporary effect theory (the temporary threshold shift - TTS) (4) is based on the observation that those noise exposures which ultimately produce permanent hearing loss also produce temporary hearing loss in young ears. Sataloff, Vassallo, and Mendulse (4) found that underground iron ore miners exposed intermittently to intense rock drill noise showed no greater hearing damage to noise exposure than do mill workers exposed to steady noise 20 dB lower. Other reports of hearing damage to miners agree with Sataloff et al (4, 5). Intermittent variable noise is the most common noise in a mining and metallurgical environment.

1.3 Standards for Noise Exposure Measurements

The noise exposure may be specified as being the constant sound level for the time duration. If the sound level varies with time, mean level must be obtained by calculation. The need for noise exposure measurements has led to several standards and recommendations. Among these are:

1. Walsh-Healey Public Contracts Act (the ACGIH Recommendations).

2. ISO Recommendation R 1999: Assessment of Occupational Noise Exposure for Hearing Conservation Purposes.

3. ISO Recommendation R 1996: Assessment of Noise with Respect to Community Response.

The relationships of these standards are shown in Figure 2 (6).

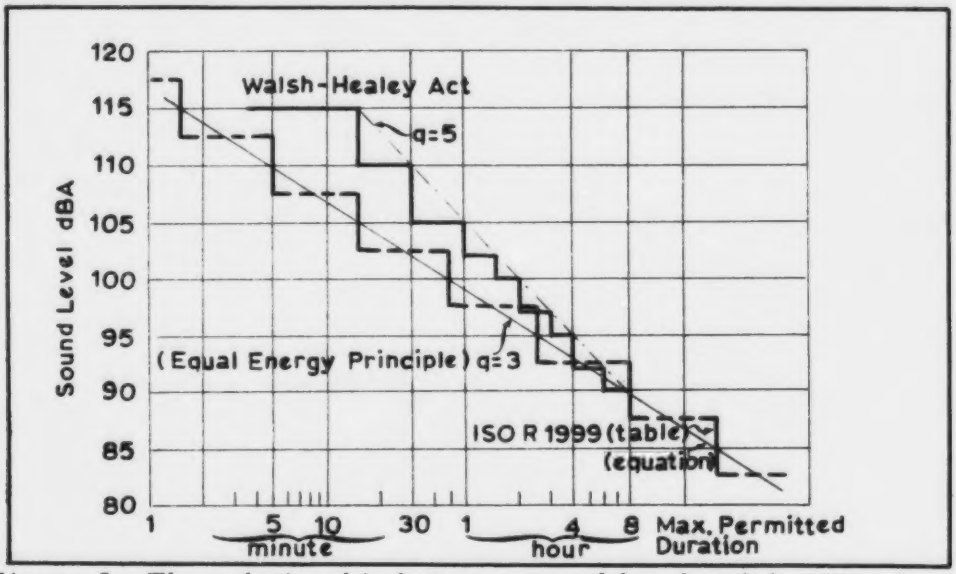

Figure 2: The relationship between sound level and duration for the Walsh-Healey Act and ISO Recommendation R 1999 proposal. (For ISO applying the criterion 90 dBA x 8 h per workday and no corrections) (4).

The comparison of the criterion of a maximum allowable level of 90 dBA for an 8-hour working day has been taken. The trading relationships in Figure 2 are in the straight line form. The slope of these straight lines is given by the symbol "q".

The Walsh-Healey Act has q = 5 dBA increase for halving the duration. ISO operates with the parameter q = 3 dBA increase of sound level for half the duration. This corresponds to constant sound energy for a given exposure (the Equal Energy Principle). For the criterion of 90 dBA for an 8-hour working day, the q = 5 curve is more convenient at higher levels than the q = 3 curve.

The American Conference of Governmental Industrial Hygienists (ACGIH) adopted the Walsh-Healey Public Contract Act as permissible noise levels in dBA. The Bureau of Labor Standards, U. S. Department of Labor, in May 1969 added a safety regulation on industrial noise exposure to the

Walsh-Healey Act. These permissible noise levels refer to sound pressure levels that represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech. The sound level shall be determined by a sound level meter, meeting the standards of the United States of America Standards Institute and operating on the A-weighting network with slow meter response.

TABLE 1

Permissible Noise Exposures*

Duration Per Day Hours	Sound Level dBA[a)]
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
3/4	107
1/2	110
1/4	115-C[b)]

a) Sound level in decibels as measured on a Standard Level Meter operating on the A-weighting network with slow meter response.

b) Ceiling Value.

* Threshold Limit Values of Physical Agents Adopted by ACGIH for 1969.

If the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered rather than the individual effect of each. If the sum of the following fractions exceeds unity, i. e.,

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \ldots \frac{C_n}{T_n}$$

where C_n indicates the total time of exposure at a specified noise level, and
T_n indicates the total time of exposure permitted at that level,

then the mixed exposure should be considered to exceed the threshold limit value. Noise exposures of less than 90 dBA do not enter into the above calculations. Impulsive or Impact Noise should not exceed 140-dB peak sound pressure level-C.

When noise levels are determined by octave-band analyses, the equivalent A-weighted sound level may be determined by plotting sound-level contours on Figure 3. The highest point of penetration into sound-level

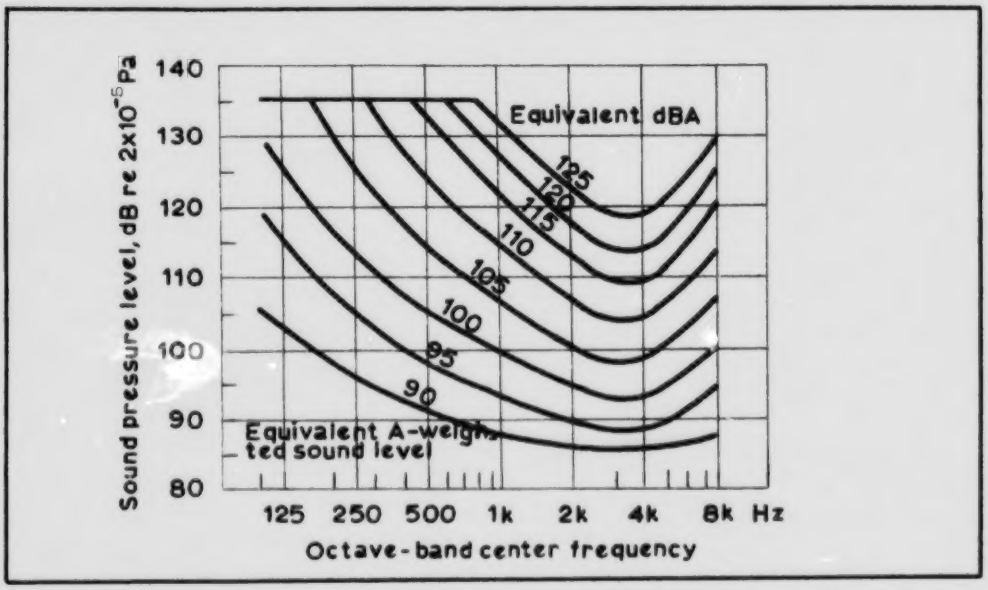

Figure 3: Equivalent A-Weighted Sound Levels (Bureau of Labor Standards).

contours corresponds to the A-weighted sound level.

The Bureau of Labor Standards points out that the "purpose of the Walsh-Healey regulations is to ensure that a worker's ears are protected".

In the meantime, the Walsh-Healey Act considers only the total daily exposure to noise and does not distinguish between a large number of brief exposures and a smaller number of long exposures which represent the same total exposure time (7). Between large numbers of brief exposures, the quiet periods play an important role in the recovery of the hearing organ. For noise that is intermittent, other criteria must be used. The simplest method is based on the report of the National Academy of Science - National Research Council Committee on Hearing, Bioacoustics, and Biomechanics, known as the CHABA report, that describes hazardous exposure to intermittent and steady-state noise (8). For intermittent noise, i.e. less than 2 minutes "on" and several minutes "off", the CHABA criteria are more accurate (9), and have been confirmed by measurements on the hearing loss of miners (10).

The Department of Labor (U.S.) advises that two means of control must be established (11, 12):

a) administrative control, and
b) engineering control,

before personnel protection devices are utilized to satisfy the regulation. Engineering controls reduce the sound intensity at the source of the noise or in the hearing zone of the workers, for example:

- maintenance,
- substitution of machines,
- substitution of processes,
- vibration dampening,
- reduction of sound transmission through solids,
- reduction of sound produced by fluid flow,
- inclusion of noise level specifications when ordering new equipment,
- isolation of noise sources,
- isolation of operator.

If noise cannot be reduced to permissible intensities through engineering controls, administrative controls should be developed in order to limit duration of workers' exposure to noise levels above 90 dBA, according to Table 1, for example:

1. Analyze the worker environment and the work cycle for noise intensities and exposure to the 90 dBA limit;

2. Eliminate, reduce, or limit a high noise level in an environment with a noise level below 90 dBA;

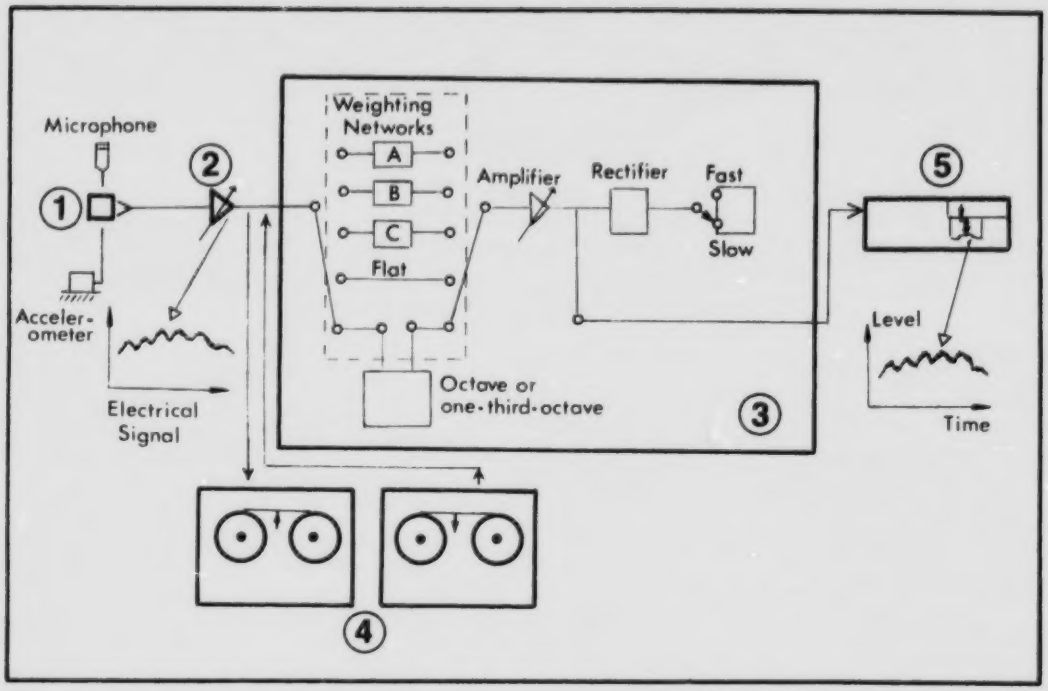

Figure 4: Block Diagram of Basic Instrumentation for the Measurement of Noise and Vibration.

1 - Transducer and Calibrator
2 - Preamplifier
3 - Sound Level Meter
4 - Tape Recorder
5 - Level Recorder

3. Provide hearing protective devices where the man hours required for a job exceed the permissible time for one man in one day for the existing sound level;

4. Periodically measure employees' sense of hearing; and

5. Provide education for employees regarding the problem of noise.

Measures such as these can be made at little cost and effort, simply by introducing noise exposure as a factor in mining and mill production planning.

2. FIELD MEASUREMENTS: EQUIPMENT AND TECHNIQUE

The measurement of noise levels should be associated with a noise control problem in a mine or mill. The conditions demanding this data should be established before the measurement project starts. From this information, suitable field and laboratory equipment can be selected.

2.1 Instruments

Instruments are required to determine the noise levels to which underground employees are exposed, to evaluate noise survey techniques and equipment, and to compare noise exposure using a sound level meter and noise exposure dosimeter.

2.1.1 Sound Level Meter

The basic system for measuring sound pressure levels or vibration acceleration levels with a sound level meter consists of the following:

1. Transducer (microphone or accelerometer) and calibrator;

2. Preamplifier (IEC R 327and ANSI S1.70-1966);

3. Sound Level Meter (IEC R123 and ANSI S1.4-1961):
   a) Sound Level Meter has built-in A, B, and C-weighting networks, "Fast" and "Slow" meter damping; and
   b) Impulse Precision Sound Level Meter has a frequency range 2 Hz to 70 kHz; A, B, C, and D linear frequency response, octave and one-third octave filter, and impulse measurement with max. RMS hold, etc. (IEC R179);

4. Tape Recorder used for field recording and storage of acoustic and vibration data, and frequency transformation;

5. Level Recorder records DC signal and RMS average or peak value of AC signals as function of time or frequency, from 2 Hz to 200 kHz;

6. Microphone and calibrator;

7. Preamplifier, and

8. Sound level meter with built-in A, B, and C-weighting networks.

2.1.2 Noise Exposure Monitor or Dosimeter

A sound level survey alone is not enough because most industrial noise levels vary. Critical areas should be continuously monitored during the work day to determine if the duration of high noise levels is longer than that permitted by the Walsh-Healey Act. A special instrument, the noise dosimeter, has been developed. In this case the noise dose may be defined as the constant sound level for the time duration (Figure 5).

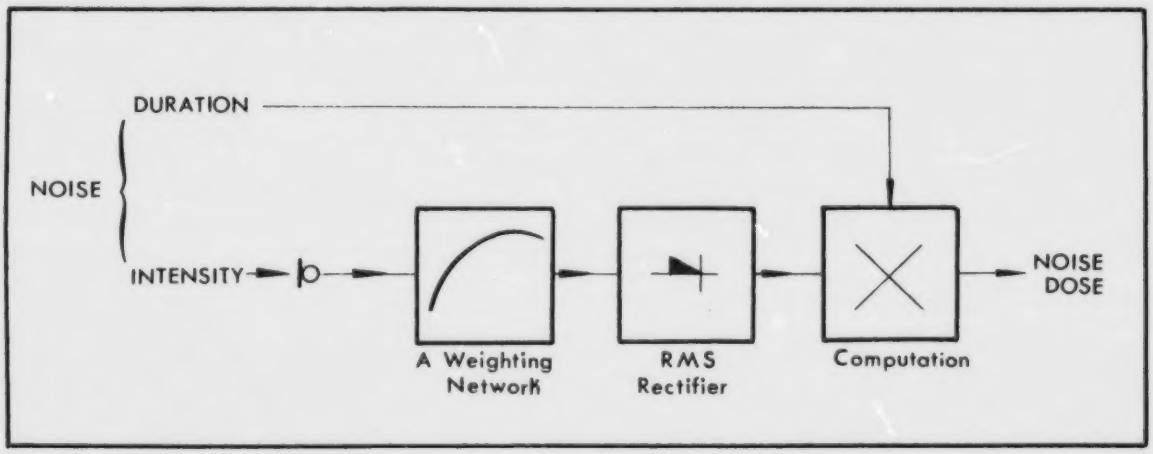

Figure 5: Components of a Noise Dose Measurement.

This instrument can be divided into two categories:

1. the Noise Dosimeter which operates in conjunction with sound-measuring equipment for table-top operation: and

2. the Noise Exposure Monitor which is an integrating sound level meter, either portable or assembled for table-top operation.

The Noise Dosimeter (B and K*, Type 4423) operates according to constant sound energy for a given dose, therefore the designation, Equal Energy Principle. Meanwhile, the Walsh-Healey Act has q = 5 (Figure 2). Simple averaging corresponds to q = 6. The value of q describes the relationship between the sound intensity and its duration. The Noise Dosimeter works in accordance with a mathematical function (13):

$$L_{eq} = \frac{q}{\log_{10} 2} \log_{10}\left(\frac{1}{T}\int_0^T \left(\frac{p(t)}{p_o}\right)^{\frac{20 \log_{10} 2}{q}} dt\right) \qquad \text{(Equation 1)}$$

where L_{eq} is the equivalent continuous sound level,
q is the parameter,
$p(t)$ is the varying sound level, and
p_o is the reference sound pressure, $2 \times 10^{-5} N/m^2$.

The Noise Dosimeter (B and K, Type 4423) works according to the equal energy principle, i. e. using parameter q = 3 in Equation 1:

$$L_{eq} = 10 \log\left(\frac{1}{T}\int_0^T \left(\frac{p(t)}{p_o}\right)^2 dt\right) \qquad \text{or,}$$

$$L_{eq} = K + 10 \log\left(\frac{1}{T}\int_0^T V_p(t)^2 \, dt\right) \qquad \text{(Equation 2)}$$

where $V_p(t)$ is the voltage representation of $p(t)$ within the instrument (Figure 6) and,
K includes p_o along with the instrument constant.

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* Bruel and Kjaer (Canada) Limited.

The RMS rectifier has been combined with the squaring function required for dose measurement, so that only one squaring network is required. The integration is performed through a voltage-to-frequency converter and a counter, and the Noise Dose Count (NDC) registers with a counter. The measurement duration, T, is registered on the Elapsed Time Counter. In the connected sound level meter, the attenuator setting (Att) is noted, and separating it from the constant K, found in Equation 2:

$$L_{eq} = Att + K^1 + 10 \log \frac{NDC}{T} = Att + X \qquad \text{(Equation 3)}$$

where X is obtained from the conversion slide rule (B and K, OH 0007).

A third counter is provided to register when system overload occurs, with a resolution of 0.1 mhour (Figure 6).

In order to compare noise dose measurements on continuous and impact noise, tape recordings were made of traffic noise and noise from mining machines (Figure 6).

Noise Exposure Monitor detects information on time-varying noise exposure in industrial plants. Most mining and industrial noise is intermittent. Critical areas should be monitored through the work day.

Two Noise Exposure Monitors assembled for table-top operation are available on the market:

General Radio, 1934 Noise Exposure Monitor, and
Bruel and Kjaer, Model 165 Noise Exposure Monitor.

The Noise Exposure Monitor (GR, Type 1934) accepts noise information twice per second and displays the percent of noise exposure or percent of test time as selected by panel pushbuttons. There are eight pushbutton-selected times for the 60 Hz line, of 8, 8.25, 8.5, 8.75, 9, 16, 16.5, and 17 hours. Measurement stops and results are stored for display when % Limit reaches 999%. The instrument has a sound level calibrator, data printer, and recorder.

The Bruel and Kjaer Noise Exposure Monitor, Model 165, is calibrated and, at the end of the full work shift, the counter readings are recorded again on the log form. The range switch has five levels.

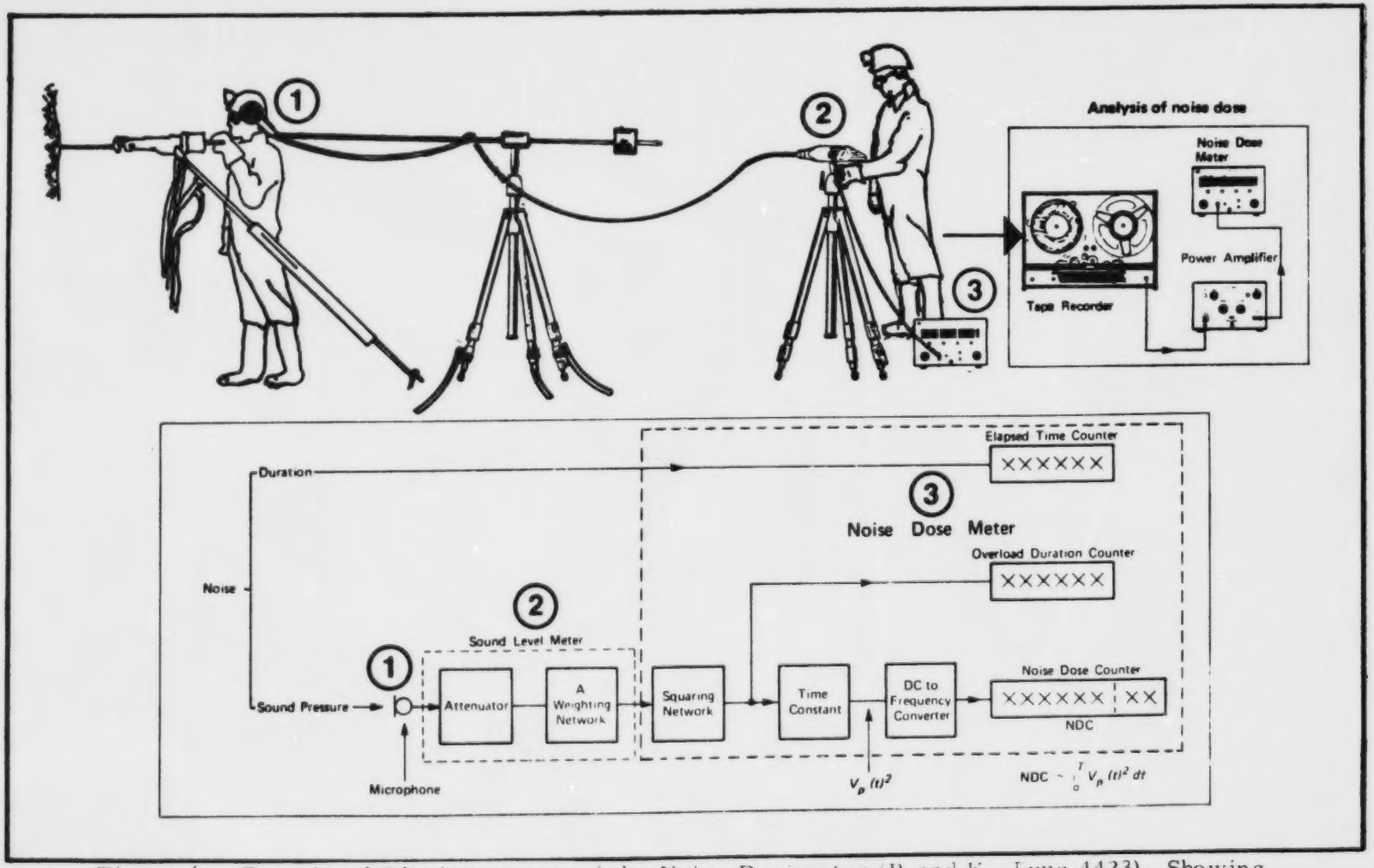

Figure 6: Functional Block Diagram of the Noise Dosimeter (B and K, Type 4423), Showing Measurement Set-Up Including Sound Level Meter and Analysis of Noise Dose.

The Data Log identifies the exposure times for each level range plus the total monitoring time for each range. These four values tie into the Walsh-Healey Act formula to specified noise exposure times.

The Computing Noise Monitor (B and K, Model 169) is a portable, integrating sound level meter which computes the Walsh-Healey coefficient of the environment from selected sample times of 1, 3, and 10 minutes. These sample lengths allow the analyst to select a sample time which includes all the functions of a machine cycle. The Computing Noise Monitor can integrate the impulse signal into the calculation of the Walsh-Healey coefficient. Most sound measuring instruments cannot detect the impulsive energy signals. An optional plug-in printer provides a permanent record of the data. Two circuits operate from the rectified sound signal. For values above 90 dBA, the signal amplitude is expended according to the Walsh-Healey curve in Figure 7 and integrated for 1, 3, or 10 minutes. At the end of the sample period, the integrated value is "held" and is then indicated on a digital meter. At the same time, on the second channel, the sound signal is integrated and, at the end of the sample period, is held. This signal in the logarithmic value is indicated on the digital meter in dBA sound pressure level. A digital panel meter displays these values at the end of the computing cycle. A repetitive mode causes the Computing Noise Monitor (B and K, Model 169) to measure for the selected time sample, print the Walsh-Healey coefficient or average sound pressure level, reset, and repeat automatically.

The Environmental Noise Classifier (B and K, Model 166) classifies noise levels into amplitude bands. The instrument has application in industry, especially where irregular noise patterns require analysis. The operating range is divided into twelve amplitude classes and a minimum range of 60 to 90 dB, up to a maximum of 100 to 130 dB (Figure 8). The Model 166 serves as an area noise dosimeter, particularly where mixed exposure calculations are necessary. At present it is the best instrument to use to establish compliance with the OSHA code stipulating mixed exposure levels.

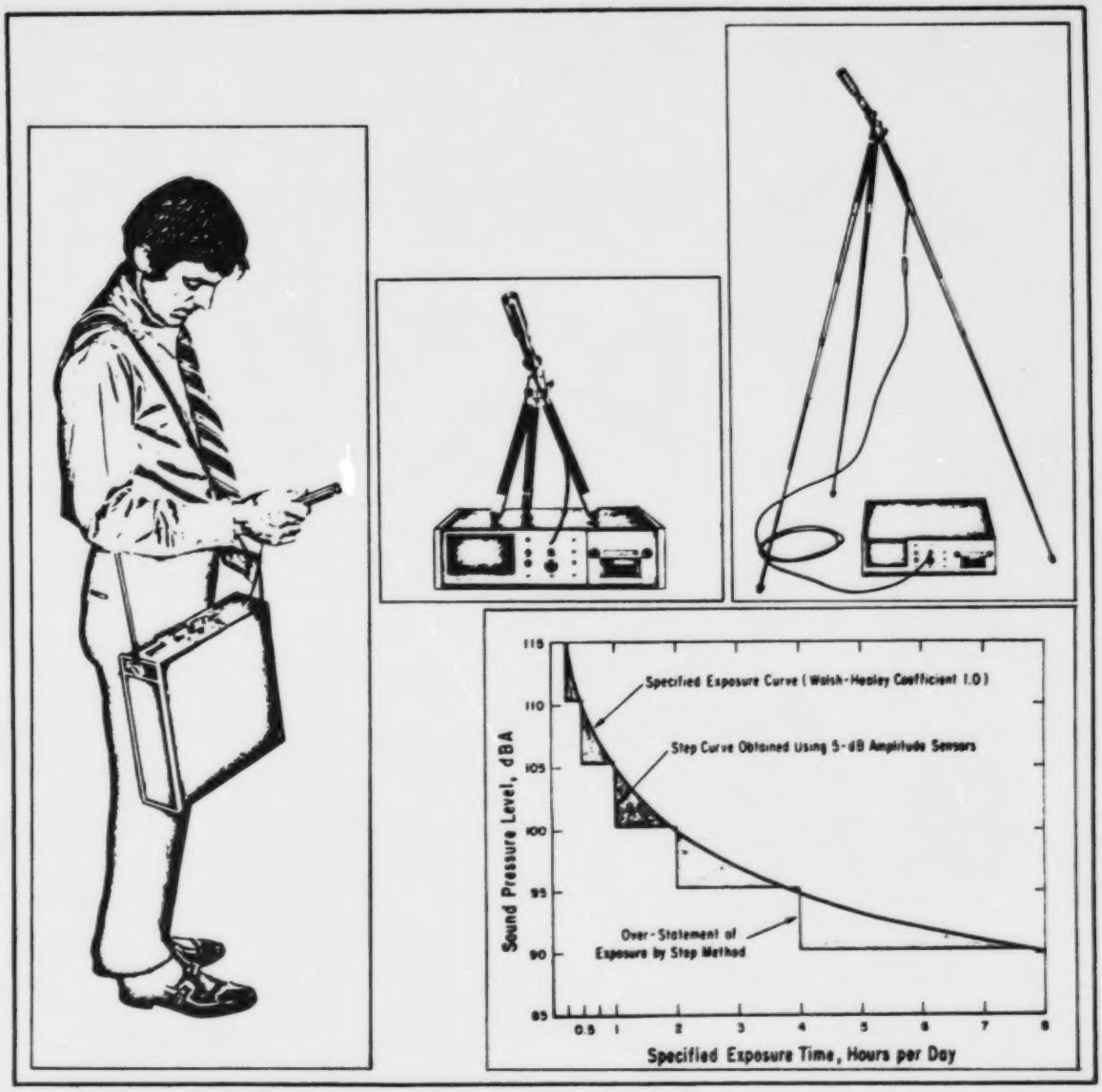
Specified Exposure Curve (Walsh-Healey Coefficient 1.0)
Step Curve Obtained Using 5-dB Amplitude Sensors
Over-Statement of Exposure by Step Method
Sound Pressure Level, dBA
Specified Exposure Time, Hours per Day

Figure 7: Computing Noise Monitor (B and K, Model 169) designed for portable or table-top operation. The Model 169 follows the curve according to the Walsh-Healey Act. The Walsh-Healey coefficient 1.0 indicates that the maximum permissible noise exposure has been reached (14).

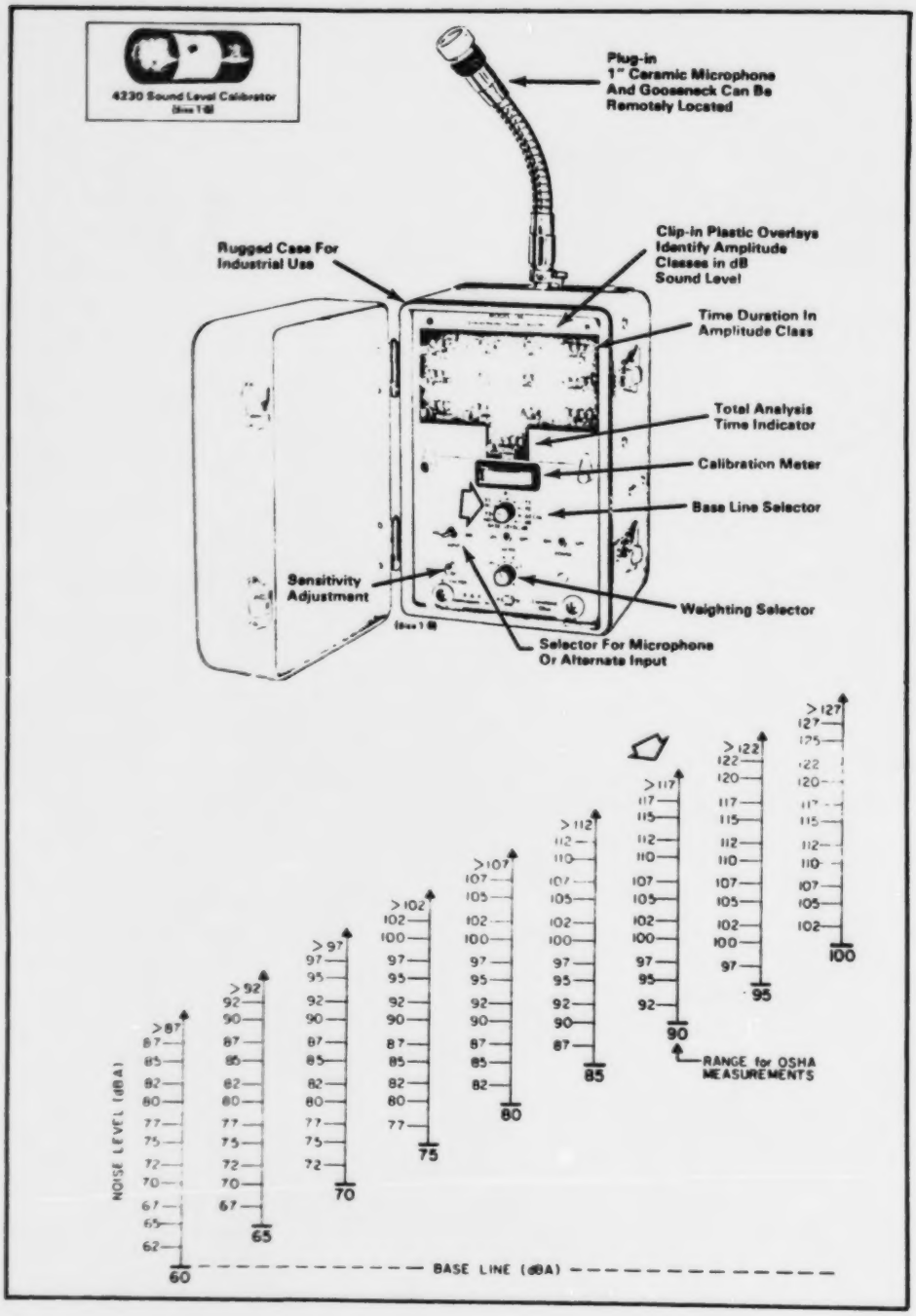

Figure 8: The 166 Environmental Noise Classifier. Each range is divided into 11 classes of alternate 2- and 3-dBA. The 12th classification indicates levels higher than the 11th band (14).

Sound Pressure Integrator (Columbia, Model SPL-101) is a fully automatic portable instrument that computes the cumulative daily noise exposure to determine if the noise level is within the tolerance of the Walsh-Healey Contracts Act.

The automatic computation is achieved by summing the fractional exposures (C/T) as shown in Table 1 for the noise provisions within the daily time limitations as accorded under this act. When the permissible limit is reached, a red warning light turns on. If the sound level in the area surpasses 115 dBA, an amber light glows. The instrument is simple to use and can be operated by inexperienced personnel.

Recording Sound Pressure Level Integrator (Columbia, Model SPL-101R) offers all of the features of the above described Model SPL-101 integrator, but incorporates a built-in miniature strip chart recorder that provides a permanent and continuous record on paper of the sound pressure level (logarithmic scale) versus time over a specified period.

Several types of Noise Exposure Dosimeters are on the market. The Personal Noise Dosimeter is a fully automatic portable instrument that electronically totals the cumulative daily noise exposure to determine if the person wearing this instrument is working in a sound environment within the allowable time/noise limits specified by the Walsh-Healey Contracts Act and/or the Occupational Safety and Health Act of 1970. This instrument performs its measurements with absolutely no effort on the part of the employee. Of equal importance, its light weight and small size permit it to be worn with no hindrance to the employee's work (Table 2).

The Noise Exposure Monitor (GR type 1944), the Noise Exposure Indicator (GR Type 1944) (15), and the 1150 Noise Exposure Monitor 1100 Readout Unit (Bendix, National Environmental Instruments Inc.) (16), are preferred over all equivalents in Table 2 because:

1. instrumentation will not become obsolete when the law changes;
2. small, shirt-pocket size, lightweight, 0.213 kg (GR) and 0.170 kg (Bendix);
3. long battery life, 300 hours;
4. the calibrator checks the complete system including microphone;
5. readout available only to authorized personnel.

The GR 1944 Noise Dosimeter is about twice as accurate as the sound level meter. The Bendix 1150 Noise Exposure Monitor has low storage capacity (255%).

TABLE 2

Noise Dosimeters - Competitors

	Competitor	Instrument	Range	115 dBA Exceeded	Microphone		Calibration	Power	Weight	Notes
					Type	Directivity				
1.	Bausch and Lomb Optical Company Ltd.	05-81-59 Dosimeter 05-81-57 Calibrator	90 dBA to 115 dBA	A red miniature solid state lamp turns on for a minimum one second.	Piezo-electric	Omni-directional	At 100 dB and at 114 dB Prefrd. freq. 125 Hz, 250 Hz, 500 Hz, 1000 Hz and 2000 Hz.	2 x 22.5 volt Neda 215 batteries. Life is 40 hr.	0.482 kg	Products: Columbia Research Laboratories Inc.
2.	Bendix National Environmental Instruments Inc.	1150 Noise Exposure Monitor 1100 Readout Unit	90 dBA to 115 dBA	An automatic alert light turns on.	Ceramic	Non-directional	1100 Readout Unit built-in calibration check of monitors.	2 x 9 volt batteries. Life is 300 hr.	0.170 kg	85 dBA provision is built in.
3.	Columbia Research Laboratories Inc.	SPL-104 AB Noise Dosimeter SPC-14 Calibrator	90 dBA to 115 dBA	A red miniature solid state lamp turns on for a minimum one second.	Piezo-electric	Omni-directional	At 100 dB and at 114 dB Prefrd. freq. 125 Hz, 250 Hz, 500 Hz, 1000 Hz, and 2000 Hz.	2 x 22.5 volt NEDA 215 batteries. Life is 40 hr.	0.482 kg	
4.	E. J. du Pont de Nemours & Co. (Inc.)	Audio Dosimeter	90 dBA to 115 dBA	Light emitting diode in dosimeter.	Ceramic	Non-directional	Factory calibrated -- acoustically and electrically.	9 volt battery NEDA 1604 80-hr battery life.	0.241 kg	No calibration.
5.	General Radio	GR 1944 Noise Exposure Monitor GR1944 Noise Exp. Indicator	90 dBA to 115 dBA	The information is stored in the monitor unit and read out on the indicators.	Ceramic	Omni-directional	GR 1944 Noise Exposure Indicator built-in sound level calibrator.	9 V battery Burgess 2U6 about 300 hr operation.	0.213 kg	85 dBA provision is built in.
6.	Magnatronics	Monitor Readout	90 dBA to 115 dBA							Only film production.
7.	Quest Electronics	M-6 Sound Hazard Integrator C-10 Sound Level Calibrator	90 dBA to 115 dBA	An internal electronic latch is activated by a short duration noise impulse.	Ceramic	Omni-directional	At 85, 90, 95, 100, 105, 110, 115 and 117 dB at 1000 Hz	18 volt replacement Ni-Cd battery NCB-18 or additional battery charger C-825	0.709 kg	Exposed readout.
8.	3M Company	NMI Monitor NCCI Charger/ Calib.	90 dBA to 115 dBA							Only film production.
9.	Willson Products Division	IN-14 Sound Consultant Personal Unit.	90 dBA to 115 dBA	An indicator or the readout unit will light.	Ceramic	Omni-directional	Calibrated at factory.	1 Ray-O-Vac #813 Alkaline-Manganese "D" Cell, (NEDA #13A) 8 hr. battery life.	0.539 kg	No calibration.

N.B.	Storage Capacity		Storage Capacity
1. Bausch and Lomb	1% - 999%	6. Magnatronics	No data
2. Bendix	1% - 255%	7. Quest Electronics	1% - 999%
3. Columbia	1% - 999%	8. 3M Company	No data
4. E. J. du Pont de Nemours	1% - 3200%	9. Willson Products	No data
5. General Radio	1% - 999%	Tracor (Texas)	1% - 999%

2.2 Technique for Analysis of Results

The sound level meter (B and K, Type 2205) was used to observe the sound levels. It was operated on the A-weighted slow response and calibrated with the B and K Type 4230 calibrator before and after shift (17). The high humidity in the mine and the abrupt change of temperatures caused the condensation of water drops which were found inside the case. For this reason, one measurement (08/02/73) had to be interrupted. To prevent this from recurring, the seams of the instrument were covered with tape (Figure 9).

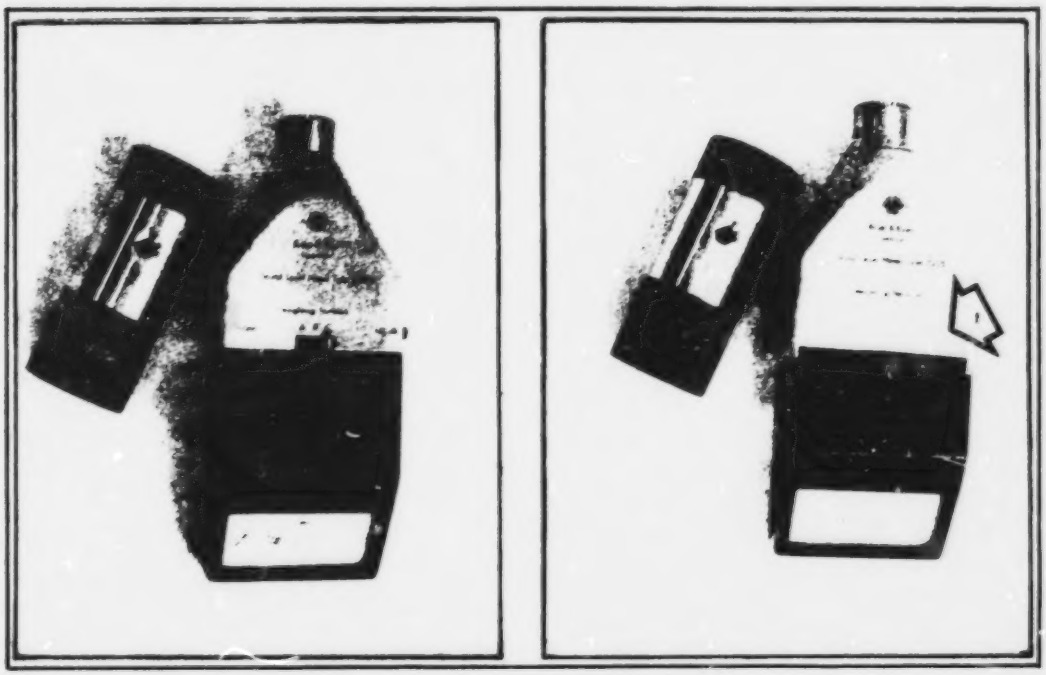

Figure 9: The Sound Level Meter with Seams Taped to Protect Interior from Dust and Water.

Construction of the universal attachment permitted technical development for measuring noise level criteria (18). Sound level measurements were usually taken within one metre of the miner's ear. The total duration of exposure time in hours was determined by full-shift time studies and partial-shift time studies. Records of such surveys show the instruments used, data and location of the test, machinery or equipment generating the noise, and the names of the operators.

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3. NOISE MEASUREMENT AT DENISON MINES

3.1 Underground Labor Distribution

The underground labor distribution in Denison Mines is shown below (19) (Figure 10).

	No. of Personnel
Staff	
U/G Supt.	1
Captains	1
Shift Bosses	2
Geologists	1
Engineers	2
Total Staff	7
Stoping	
Drillers, helpers	8
Timbermen, helpers	4
Fill Men	2
Slushermen	4
Haulage operators	2
Other	4
Total Stoping	24
Development	
Drillers, Drifting	18
Slushermen	8
Other	8
Total Development	34

	No. of Personnel
Haulage, Hoisting	
Loader operators	18
Chute Pullers	13
Ore, Waste Pass	8
Skip Tenders	2
Cage Tenders	4
Top Men	2
Hoistmen	6
Other	2
Total Haulage and Hoisting	55
General	
Pipe Fitters	7
Trackmen	2
Ventilation Crew	6
Warehousemen	2
Lampmen	6
Riggers	9
Fill preparation	4
Mechanics	66
Electricians	20
Exploration drillers	2
Other	8
Total General	132
Total Mine	453

The crusher operators belong to the mill force and do not figure in the survey of underground labor distribution.

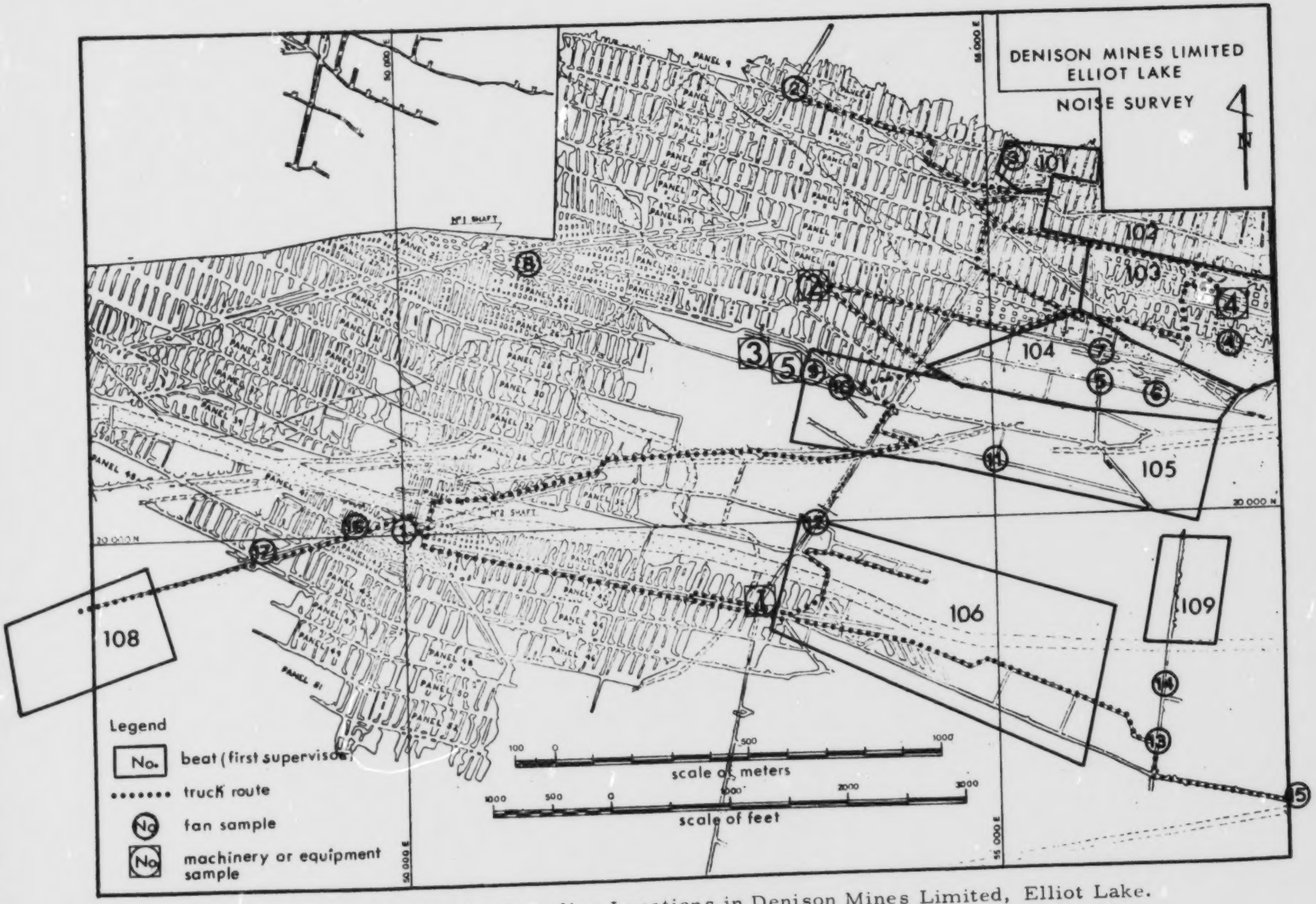


Figure 10: Mine Layout and Noise Sampling Locations in Denison Mines Limited, Elliot Lake.

There are two shifts. The underground labor distribution per beat per shift is as follows.

Beat No.	Number of Men/Shift	Type of Mining		
		Jumbo Drill	Long Hole	Jack Leg
101	18		x	x
102	33		x	x
103	36	x	x	x
104	43	x	x	x
105	32	x		x
106	16	x		x
108	5			x
109	1*			x
107**	4			x
112**	9		x	x
Total	197			

* Raise contractor
** Special

In one shift about 200 men use the shaft and truck to reach their beat (Figure 10).

3.2 Noise Levels from Lockers to Beat

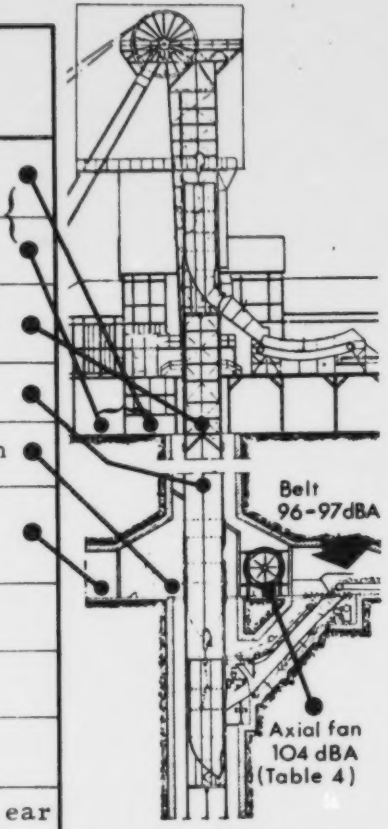
About 400 noise measurements were made between lockers and beat. The results are shown in Table 3.

Between the lockers and underground truck station in the vicinity of the shaft, the miners are not exposed to noise. The truck departure tested good, but a few measurements were taken at arrival. The result is not complete. On Panel 24, the Unimog man carrier (truck) was tested at the driver's ear. This test was to check the result, "truck at arrival", 93.9 dBA. The noise level at the driver's ear during the truck drive in both directions is the same as during the drive from Panel 24 to Shaft No. 2, slope, 101.2 dBA $\approx$ 101.6 dBA (Table 3).

TABLE 3

Noise Levels between Lockers and Beat Area in Denison Mines, Elliot Lake

Location	dBA				Number of Samples	dBC	Notes
	Min.	Max.	Mean	Std. Dev.			
Lamp room	62	68	65	4.3	11	75-82	
Staging area	60	74	66	4.8	14	78-84	
Top of rail	65	85	74.5	7.8	8	78-90	Entrance to shaft
Shaft	65	86	73	5.8	37	90-94	
Mining horizon	85	92	87.7	1.7	12	97-98	Shaft station
Between ventilation doors	73	81	76	2.8	9	--	
Truck station	80	82	80.7	0.9	7	87-88	
Truck →	87	112	97.3	5.1	191	98-110	Departure
Truck ←	88	98	93.9	3.5	7	--	Arrival
Truck ⇄	95	104	101.6	2.1	29	--	At driver's ear on Panel 24
Truck ↙	94	101	101.2	2.1	28	--	At driver's ear from Panel 24 to Shaft No. 2, slope (Fig. 10)



No.2 SHAFT

The noise level difference between driver and miner is 3 dBA which is very real. The value 97.3 dBA "departure-arrival" is used in our calculations. The driving time to every beat was taken and thus the exposure time was calculated.

3.3 Noise Levels of Fans and Ventilation Systems

Adequate and efficient ventilation systems are a prerequisite for any uranium mine, not only for fresh air, but also for reduction of dust and radon emanation (20) (Figure 11). Therefore, a large number of small auxiliary fans and filters are used for ventilation of mine working areas. "The basic area of concern in vane-axial fan application is for those acoustically critical systems where line-of-sight contact may exist between fan and human ear or for systems that have relatively little natural attenuation, e.g. underground roadways" (21). The test results of 17 fans (Figures 10 and 11) are given in Table 4 and summarized below. The average noise of small auxiliary fans is:

	No. of Samples	dBA	Std. Dev.	dBC	Std. Dev.
At 1 m distance on axis	8	98.6	3.85	102.7	3.05
At 1 m distance vertically from axis	14	95.7	4.46	99.6	5.38

The relation in noise between Woods and Sheldon fan manufacturers is:

		No. of Samples	dBA	Std. Dev.	dBC	Std. Dev.
Sheldons	At 1 m distance on axis	4	96.3	3.86	101	2.70
	At 1 m distance vertically from axis	5	95.4	5.68	99.2	6.83
Woods	At 1 m distance on axis	4	101	2.16	101	2.70
	At 1 m distance vertically from axis	9	95.9	4.01	99.8	4.86

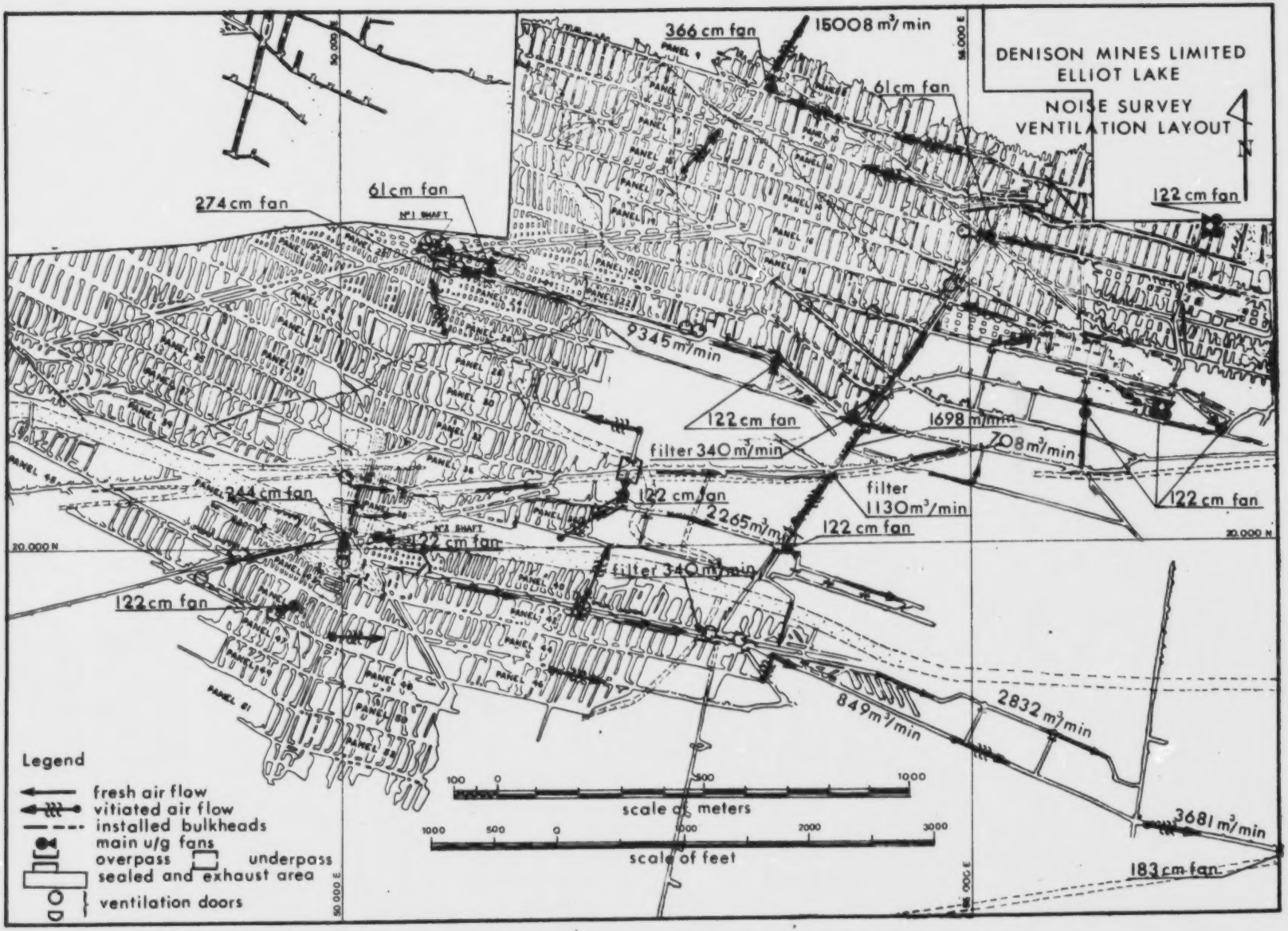


Figure 11: Ventilation Layout in Denison Mines Limited, Elliot Lake.

TABLE 4
Sound Pressure Levels of Fans in Denison Mine

No.	Manufacturer	Type	Volume			Silencer	dBA	dBC	Notes
			kW	m³/min	rpm				
1	Sheldons	Axial ϕ 244 cm	261.1	9060	700	None with guide vanes	In 104 Out 104	In 110 Out 108	At distance 10 m on axis.
2	Sheldons	Axial ϕ 366 cm	261.1	15000	600	None with guide vanes	In 104 Out 111	In 104 Out 111	At distance 10 m on axis.
3	Sheldons	Centrifugal 135-B	3.7	~85	3500	None	In 90-91 94-95	In 100 94-96	At distance 1 m on axis. At distance 1 m vertically from axis.
4	Woods	Axial Flow ϕ 61 cm	11.9	280	3500	Yes, with guide vanes	In 98 95	101 99	At distance 1 m from axis. At distance 1 m vertically from axis.
5	Woods	Axial ϕ 122 cm L. P.	11.2	990	880	None	88-90	90-95	
6	Sheldons	Combination axial & centrifugal 800 M. F.	18.7	540	1750	None with guide vanes	In 98 92-93	In 99 92-96	At distance 1 m on axis. At distance 1 m vertically from axis.
7	Woods	Axial Flow ϕ 61 cm	11.9	2830	3500	None with guide vanes	98	99	Two parallel fans. At distance 2 m.
8	Sheldons	Axial ϕ 274 cm	522.2	9350	700	None with guide vanes	Out 105	Out 111	At distance 10 m.
9	Woods	Axial Flow ϕ 61 cm	11.9	280	3500	None with guide vanes	99	99	At distance 1 m on axis.
10	Woods	Axial Flow ϕ76 cm L. P.	7.5	510	1750	None	96	106	
11	Woods	Axial Flow ϕ76 cm H. P.	37.3	710	3500	None	In 102 101	In 105 105	At distance 1 m on axis. At distance 1 m vertically from axis.
12	Woods	Axial Flow ϕ 61 cm	11.9	280	3500	None	In 103 98	In 105 102	At distance 1 m on axis. At distance 1 m vertically from axis.
13	Sheldons	Axial ϕ122 cm H. P.	29.8	1500	1170	None with guide vanes	In 100 90	In 105 98	At distance 1 m on axis. At distance 1 m vertically from axis.
14	Woods	Axial Flow ϕ 61 cm	11.9	280	3500	Yes, with guide vane	90	92	At distance 1 m vertically from axis.
15	Joy	Axial ϕ 183 cm	93.3	3970	1200	None with guide vanes	In 102	In 112	At distance 10 m on axis.
16	Woods	Axial Flow ϕ 48 cm	3.7	170	3500	None	In 100-1 Out 97	In 107 Out 103	At distance 1 m on axis. At distance 1 m vertically from axis.
17	Sheldons (two fans in series)	Combination axial & Centrifugal 800 M. F.	18.7		1750	None with guide vanes	In 96 94	In 100 98	At distance 1 m on axis. At distance 1 m vertically from axis.

The results show that Sheldons auxiliary fans produce less noise on the dBA scale, but the same noise on the dBC scale.

Large fans (Table 4, No. 1, 2, 8, and 15) have a high noise level (102 to 104 dBA) in their immediate vicinity, but at a distance of 30 to 40 m the noise level is less than 90 dBA. There is no more noise in the tunnels, even though the air velocities are very high. In the tunnel between the shaft and the crusher in Panel 40, twenty samples indicated a noise level of 36 to 38 dBA. Another example is the "breaker" operation in Panel 24. The noise is very high especially when breaking large blocks of ore, 110 dBA at 5 m from the breaker with a background noise of 88 dBA caused by auxiliary fans and filter stations.

3.4 Noise Levels of Haulage Equipment

An analysis of the haulage equipment was performed. Readings were taken near the operator's ear, at idle and at wide open throttle (W. O. T.) (Table 5). Readings were made on one of each vehicle and readings on subsequent vehicles could vary. Grade noise is high. The second test was taken for the moving vehicle (Figure 12 and Table 6). The values in Table 6

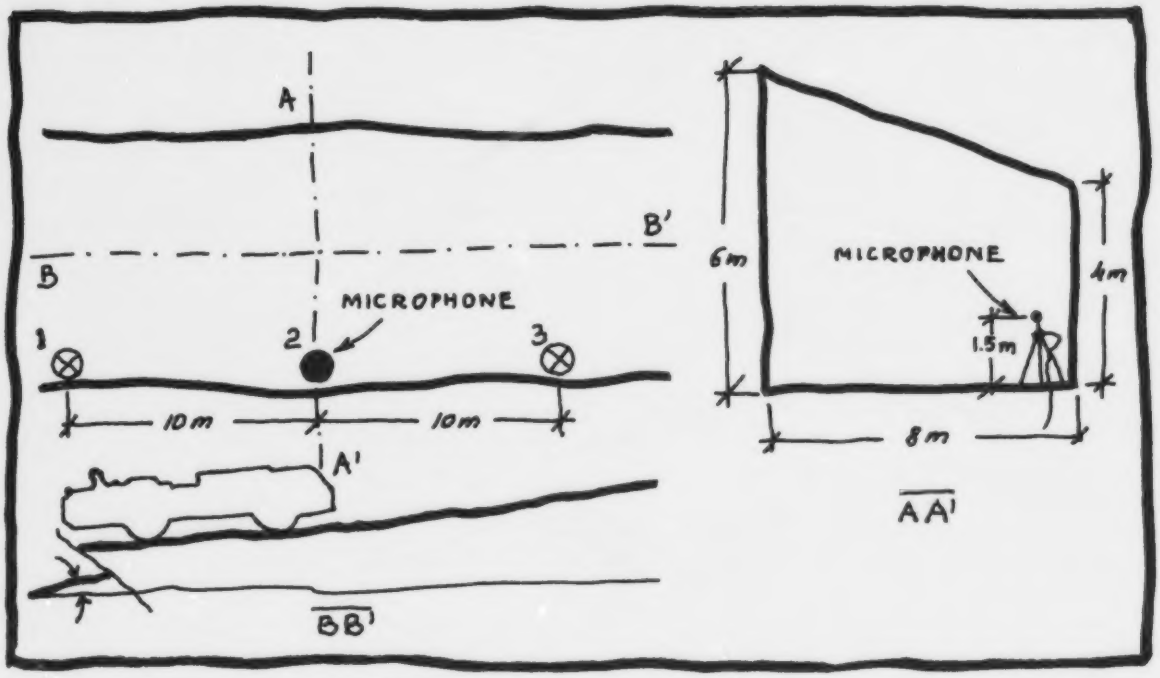


Figure 12: The Test Site Used for the Moving Vehicle on Panel 24.

TABLE 5

Noise Levels of Haulage Equipment in Denison Mines, Elliot Lake

No.	Vehicle Type and Manufacturer	Engine Type	HP	No. Cylinders	Background Noise	At Operator's Ear		Exhaust		Notes
						Idle	W.O.T. *	Idle	W.O.T. *	
1	Cline Truck (old) Cline Truck Company	Cummins Diesel	130	6	100 dBA	101 dBA	108 dBA	100 dBA	106 dBA	At 1 m distance from exhaust.
2	Cline Truck (new) Cline Truck Company	Cummins Diesel	130	6	85 dBA	91 dBA	101 dBA	92 dBA	104 dBA	At 1 m distance from exhaust.
3	Cline Truck (old) Cline Truck Company	Cummins Diesel	130	6	86 dBA	90 dBA	102 dBA	88 dBA	101 dBA	At 1 m distance from exhaust.
4	Cline Truck (new) Cline Truck Company	Cummins Diesel	130	6	80 dBA	83 dBA	98 dBA	88 dBA	104 dBA	At 1 m distance from exhaust.
5	D-6 Bulldozer Caterpillar Tractor	Caterpillar Tractor	85	6	85 dBA	88 dBA	93 dBA	88 dBA	96 dBA	At 1 m distance from exhaust.
6	MTT-420 Teletram Wagner	Deutz Diesel	195	8	82 dBA	93 dBA	103 dBA	92 dBA	104 dBA	At 1 m distance from exhaust.
7	ST-5 Scooptram Wagner	Deutz Diesel	195	8	86 dBA	90 dBA	100 dBA	91 dBA	102 dBA	At 1 m distance from exhaust.
8	Scoopmobile Mixermobile Co.	Cummins Diesel	130	6	85 dBA	92 dBA	101 dBA	90 dBA	104 dBA	At 1 m distance from exhaust.
9	Unimog (man carrier) Mercedes of Canada	Mercedes of Canada	110	6	--	85 dBA	95 dBA	85 dBA	100 dBA	At 1 m distance from exhaust.
10	Unimog Mercedes of Canada	Mercedes of Canada	52	4	88 dBA	90 dBA	94 dBA	88 dBA	97 dBA	At 1 m distance from exhaust.

* Wide Open Throttle

TABLE 6

Noise Levels of the Moving Vehicle on Panel 24, Denison Mines, Elliot Lake

No.	Vehicle Type and Manufacturer	Back-ground Noise dBA	No. of Samples	Loaded						Unloaded					
				1*		2*		3*		1*		2*		3*	
				dBA		dBA		dBA		dBA		dBA		dBA	
				M+	SDx	M	SD	M	SD	M	SD	M	SD	M	SD
1	MTT-420 Teletram Wagner	85	6	97	1.4	105	2.0	95.3	0.5	98.8	2.8	103	1.1	93.2	1.9
2	Cline Truck Cline Truck Company	85	6	95	0.6	102.5	1.7	94	1.2	93	3.5	100	3.7	92	1.1
3	ST-5 Scooptram Wagner	85	2	95	-	102	-	94	-	97	-	101	-	94	-
4	D-6 Bulldozer Caterpillar Tractor	85	2	-	-	-	-	-	-	92	-	96	3.0	93	-
5	Land Power	85	3	-	-	-	-	-	-	-	-	92	-	-	-

* See Figure 12.

\+ Mean.

x Standard Deviation.

show a small increase in relation to Table 5 (exhaust). The results would be better if measurements were performed by two parallel microphones. The noise at the operator's ear will have the same or approximately the same value as in Table 6, loaded (2) and unloaded (2).

Because of the trapezoid shape of the tunnel, reverberation is high and the differences of sound pressure level are very small. During ore loading measurement is more difficult, but after a short time the results show that the cycles of work and noise are repeated. The noise levels oscillate between 94 dBA and 105 dBA. Unloading at the breaker indicates a noise level of 102.5 dBA and the operator's ear.

The measurements show that the approximate value of noise levels can be estimated. It is necessary to take a larger number of measurements and, if possible, measurements with two parallel microphones.

3.5 Main Machinery Noise Levels

A full-shift noise exposure test was performed on the machines which produce the most noise in the mine: crusher, breaker, hammer drill, drifter (long hole drilling), and three-boom jumbo drill (Figure 10). Each machine was treated separately.

3.5.1 Crusher (Figure 10, No. 1)

The crusher was tested twice for the following reasons:

i) 05/02/73 was a Monday and the operator started to work later because the bins had been empty for a long time, and
ii) to check the accuracy of our measurements during normal work, on 13/02/73.

The operator (05/02/73) was working faster and loaded larger amounts of ore into the jawcrusher. The effective working time was about 3 1/2 hours and the total noise exposure 240% (Figure 13). The noise of 90 dBA to 95 dBA was caused by a vibrating screen. The noise time intervals were short (Figure 14). The operator (13/02/73) was working slower and needed about 4 1/2 hours for the same work. The total noise exposure was 235% (Figure 15). The noise level of 92 dBA was related to the vibrating screen. The noise time intervals were longer (Figure 14).

The comparison of those two jobs (Figure 13 and 15) shows that the noise level depends upon the amount of ore which is processed and with the increase of production we can predict a total noise exposure.

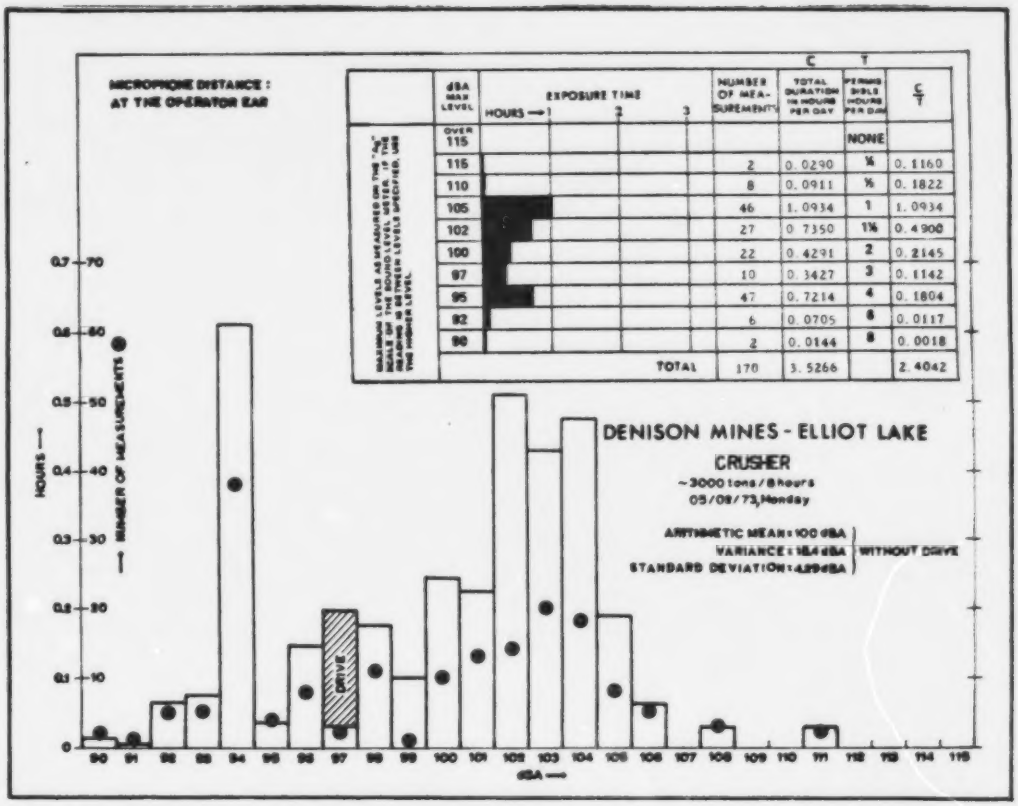


Figure 13: Crusher Operator Exposure Histogram (05/02/73).

DENISON MINES - ELLIOT LAKE — Crusher Data: 05/02/73

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	360 - 379	400 - 419	N
90		2																			2
92		3	2			1															6
95	1	12	19	6	3	4	2														47
97	2	3	1	1	1			1	1												10
100		8	4	6			1	1			1		1								22
102	3	4	4	1	7	1			2	1	1	2							1		27
105	2	9	7	12	4	4	2	1	1			1	1					1	1		46
110	3	1	2		2																8
115		1			1																2
>115																					
Σ	11	43	39	26	18	10	5	3	4	1	2	3	2					1	1	1	170

Figure 14: Distribution of A-Weighted Sound Levels of Crusher Noises Sorted into Groups of Duration Times (05/02/73).

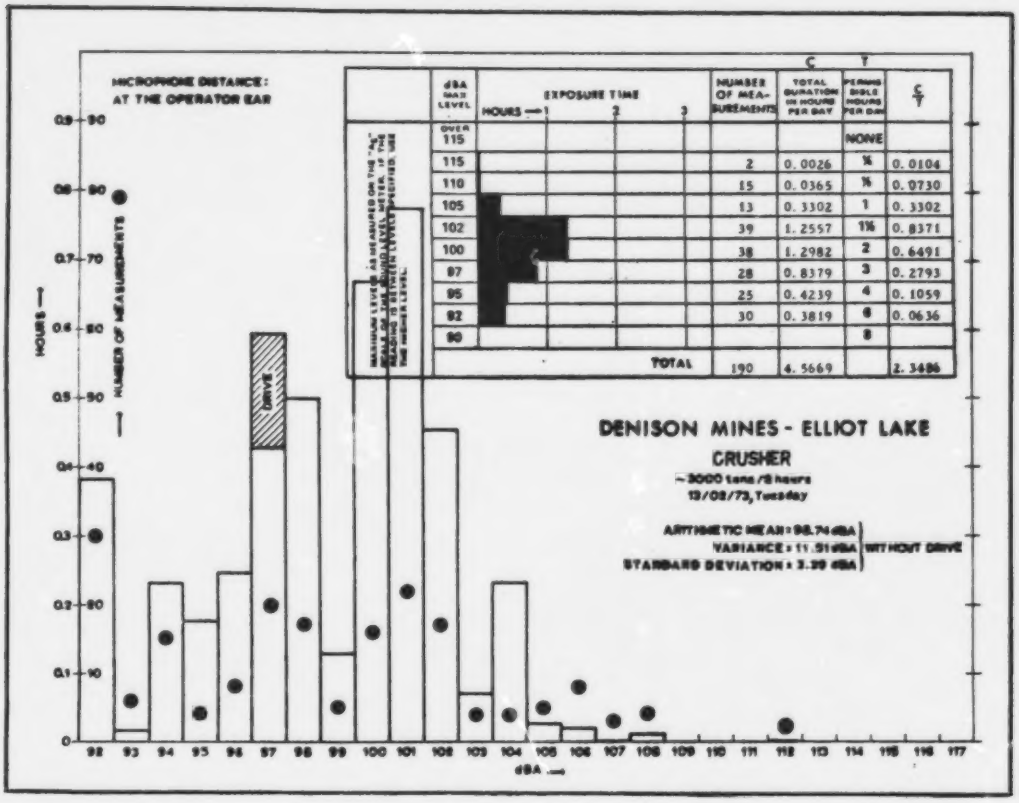


Figure 15: Crusher Operator Exposure Histogram (13/02/73).

DENISON MINES - ELLIOT LAKE — Crusher Data 13/02/73

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	375	540	600	640	653			Σ
90																									
92	9	8	7	3				1		2																30
95	9	6	4	4									1								1					25
97	8	3	3	1	4	4	2		1		1															27
100	2	2	6	6	6	4	3	3	1	1	1		1		1							1	1			38
102	3	7	3	6	2	2	5	2	2	1		2	1					1	1	1						39
105	7	1	2	1	1	1																				13
110	13	2																								15
115	2																									2
>115																										
Σ	53	29	25	21	13	11	10	6	4	4	2	2	3		1			1	1	1	1	1	1			190

Figure 16: Distribution of A-Weighted Sound Levels of Crusher Noises Sorted into Groups of Duration Times (13/02/73).

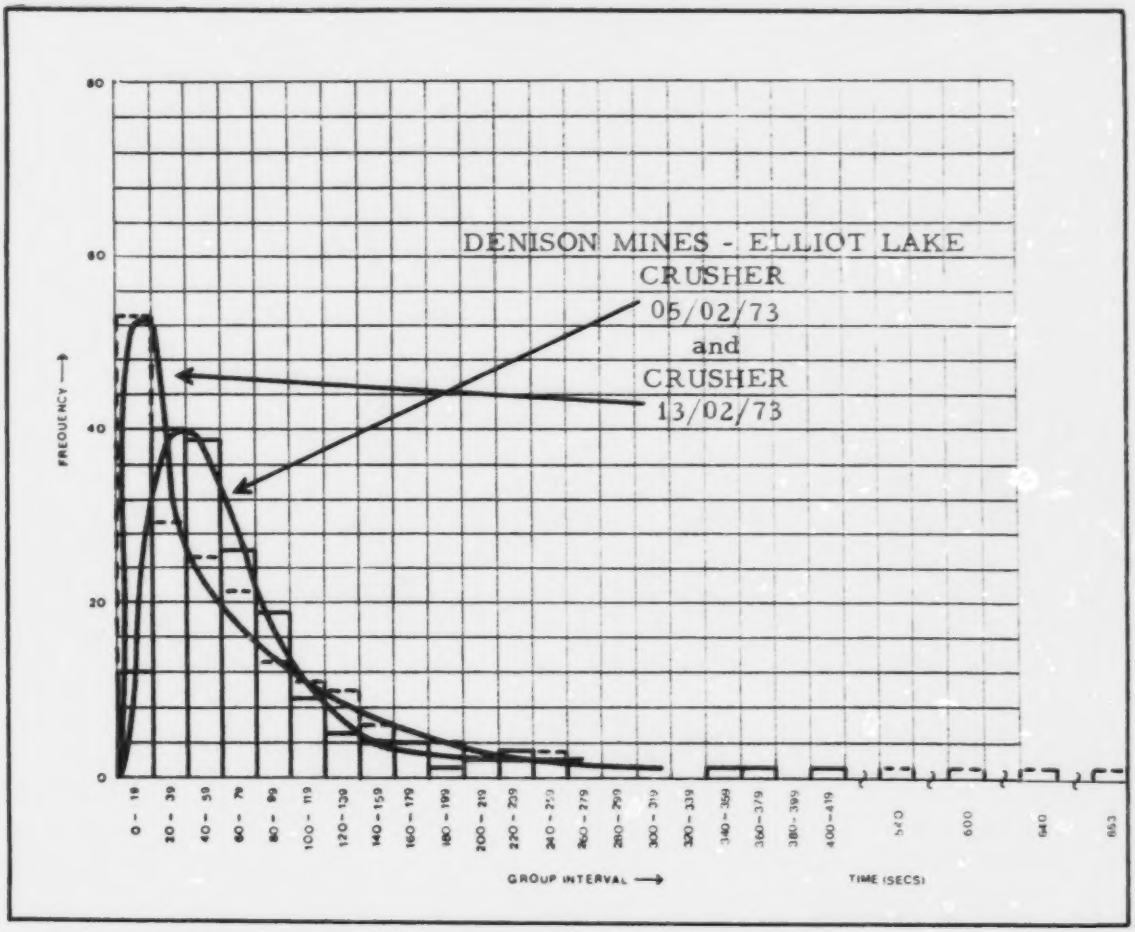


Figure 17: The Moderately Asymmetrical Frequency Curves of Operation Durations of Crushers.

The frequency of the operation durations of crushers has two different moderately asymmetrical curves, but both have approximately the same surface area($11.2\ cm^2 \simeq 10.9\ cm^2$).

3.5.2 Breaker (Figure 10, No. 2)

The tests show that, during present production, the breaker produces a relatively low noise (Figure 18) and works with very short time intervals (Figures 19 and 20), after which there are time intervals of total silence.

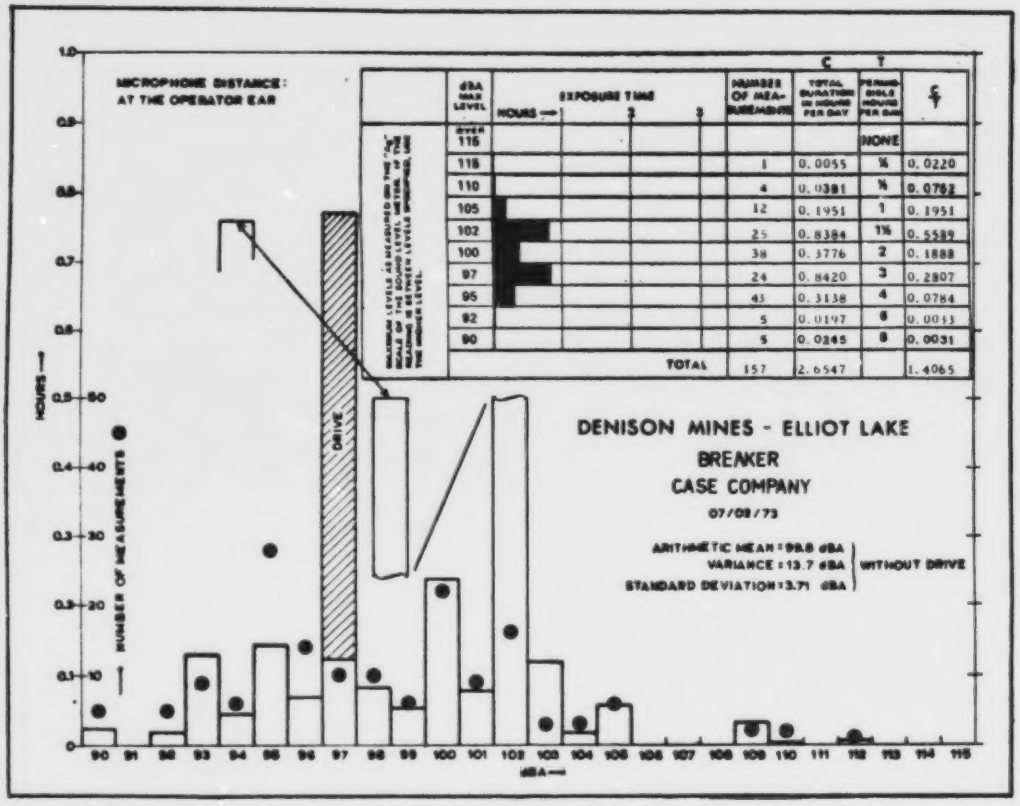


Figure 18: Breaker Operator Exposure Histogram.

DENISON MINES - ELLIOT LAKE — Breaker, Case Co. Data: 07/02/73.

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	395	1865						N
90	4		1																							5
92	3	2																								5
95	27	9		5			1				1															43
97	15	8	1																							24
100	12	12	10	1	1		1		1																	38
102	6	10	3	1	2		1												1	1						25
105	3	3	2	1	1		1						1													12
110	2	1				1																				4
115		1																								1
>115																										
Σ	72	46	17	8	4	1	4		1		1		1						1	1						157

Figure 19: Distribution of A-Weighted Sound Levels of Breaker Noises Sorted into Groups of Duration Times.

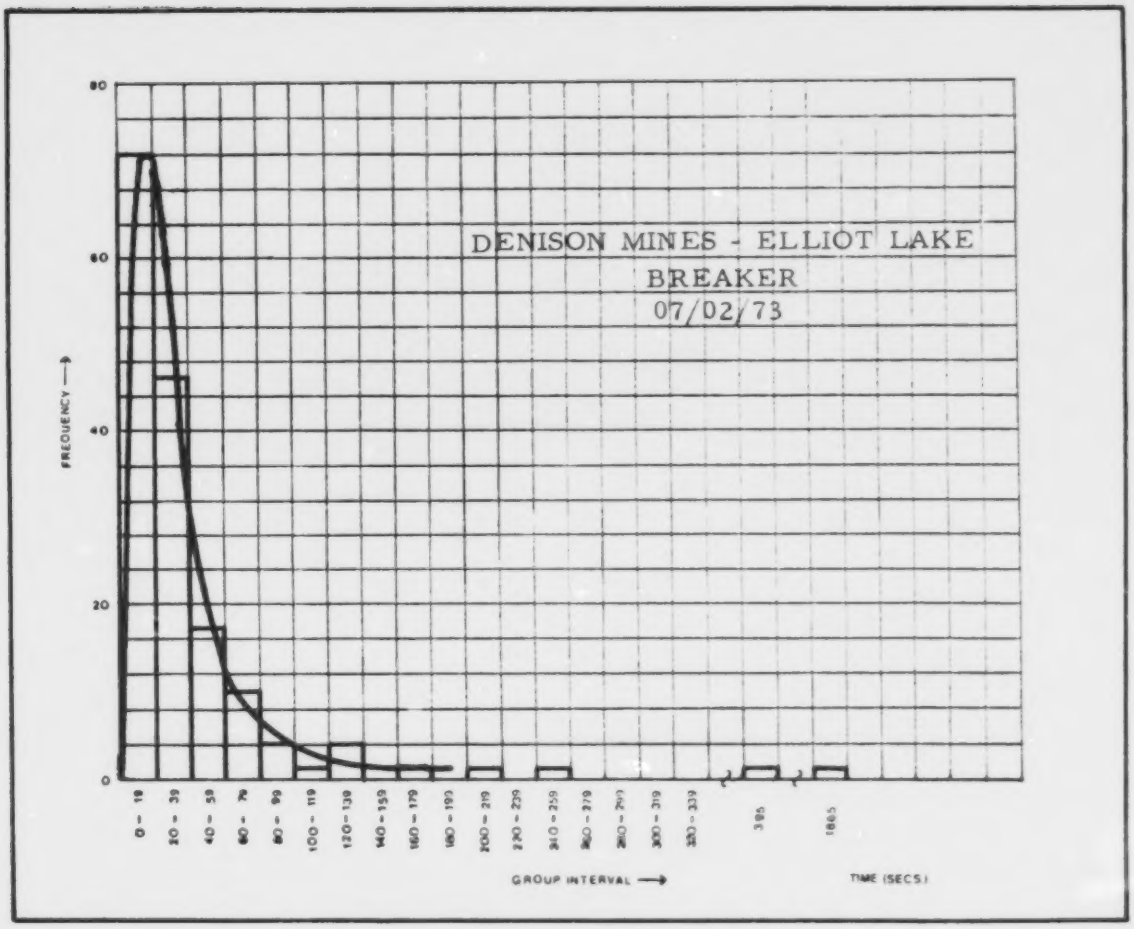


Figure 20: The Moderately Asymmetrical Frequency Curve of Operation Durations of the Breaker.

The noise levels of haulage equipment and passing moving vehicles are included in the operator exposure histogram (Figure 18). The operator is adequately protected from noise by the built-in cab.

Also, with the increase of production, we can foresee an increase in total noise exposure.

3.5.3 Hammer Drill (Figure 10, No. 3)

During the test, two miners were working with muffled hammer drills, the Joy AL-60 Air Leg. In the operator's exposure histogram, two maximums, 108 dBA and 114 dBA can be seen (Figure 21). The first maximum is from the hammer drill noise, which was not tested in parallel work. The work was very fast and effective with very short time intervals (Figures 22 and 23) and lasted about two hours. The remainder of the working time the miners spent lengthening the ventilation tube and filling the holes with explosive.

The noise is also the function of the work completed. The Joy AL-60 Airleg represents a very efficient hammer drill with 2400 strokes/min. Other hammer drills with less strokes/min need more time to complete the same work.

If our previous observation (that with the crusher for two different efficiencies we have the same noise exposure) holds true with hammer drills, then a question is posed: what is the optimum value of the total noise exposure time and how far can we go with mufflers (economic factor).

In a relatively short time the noise exposure was 472% + over 115 dBA, for over 7 minutes duration time, although the miners looked relaxed and were using only ear plugs. This can be explained by the very short noise duration times, which have already been investigated (5, 9).

3.5.4 Drifter (Figure 10, No. 4)

The first test (08/02/73) was not completed because of damage on the drifter and condensation of humidity in the instrument. During about 3 1/2 hours of work the miner was exposed to a very high noise exposure (Figures 24 and 25). Total exposure noise was 918%+ over 115 dBA for about 29 minutes. The measurements were evaluated to be compared with the measurement of full shift exposure at the same working place and with the same machines (12/02/73) (Figures 26 and 27).

The results of the measurements show that the heavy drifters, TOYO TY 150B, produce very high noise and are very dangerous. The total noise exposure is 1842%+ over 115 dBA for about 10 minutes. The noise duration is longer than that of the previous machines.

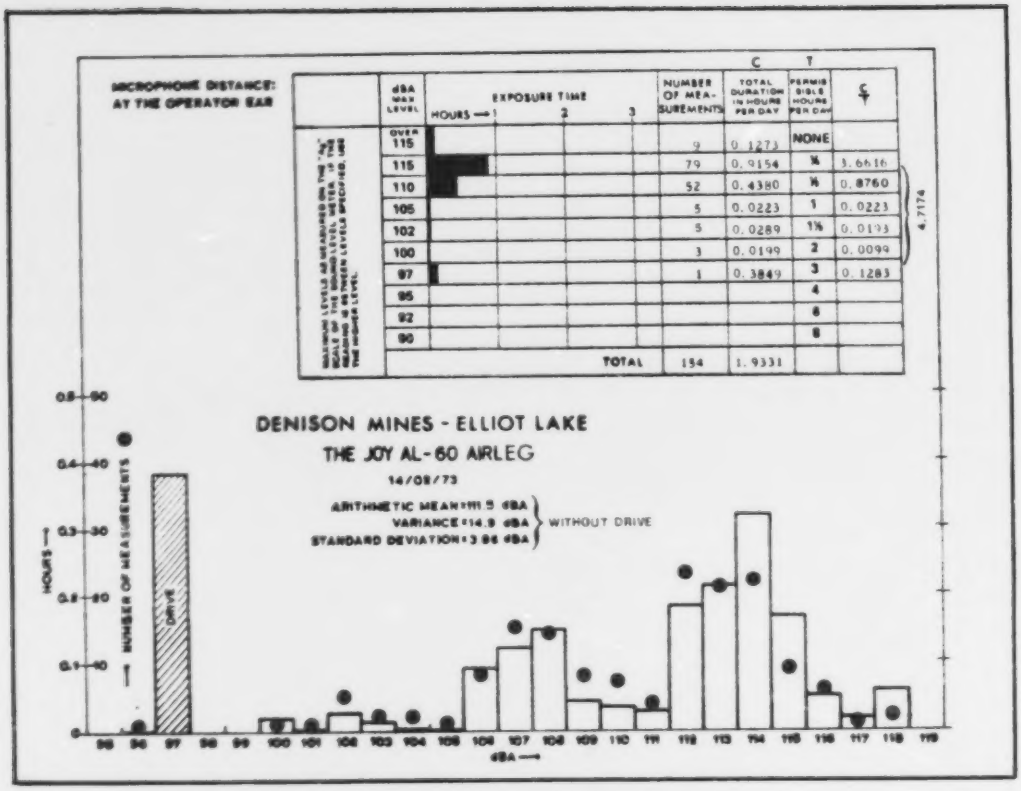


Figure 21: Hammer Drill Operator Exposure Histogram.

DENISON MINES - ELLIOT LAKE — Joy AL - 60 Airleg Data: 14/08/73

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	Σ
90																			
92																			
95																			
97	1																		1
100	1	1	1																3
102	4	1																	5
105	2	3																	5
110	25	13	7	5	1		1												52
115	18	32	11	6	3	7	2												79
>115	1	5	3	1				1											9
Σ	52	53	22	12	4	7	3	1											154

Figure 22: Distribution of A-Weighted Sound Levels of Hammer Drill Noises Sorted into Groups of Duration Times.

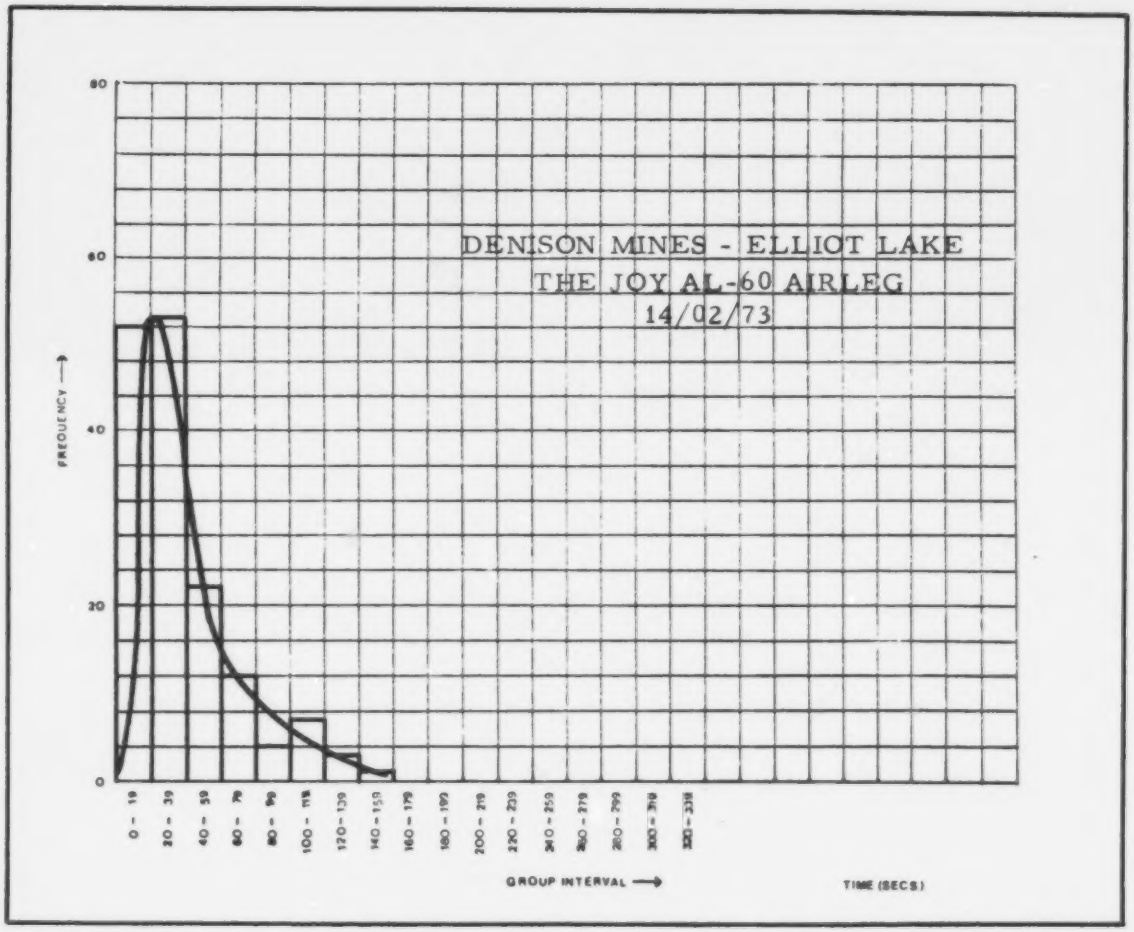


Figure 23: The Moderately Asymmetrical Frequency Curve of Operation Durations of the Hammer Drill.

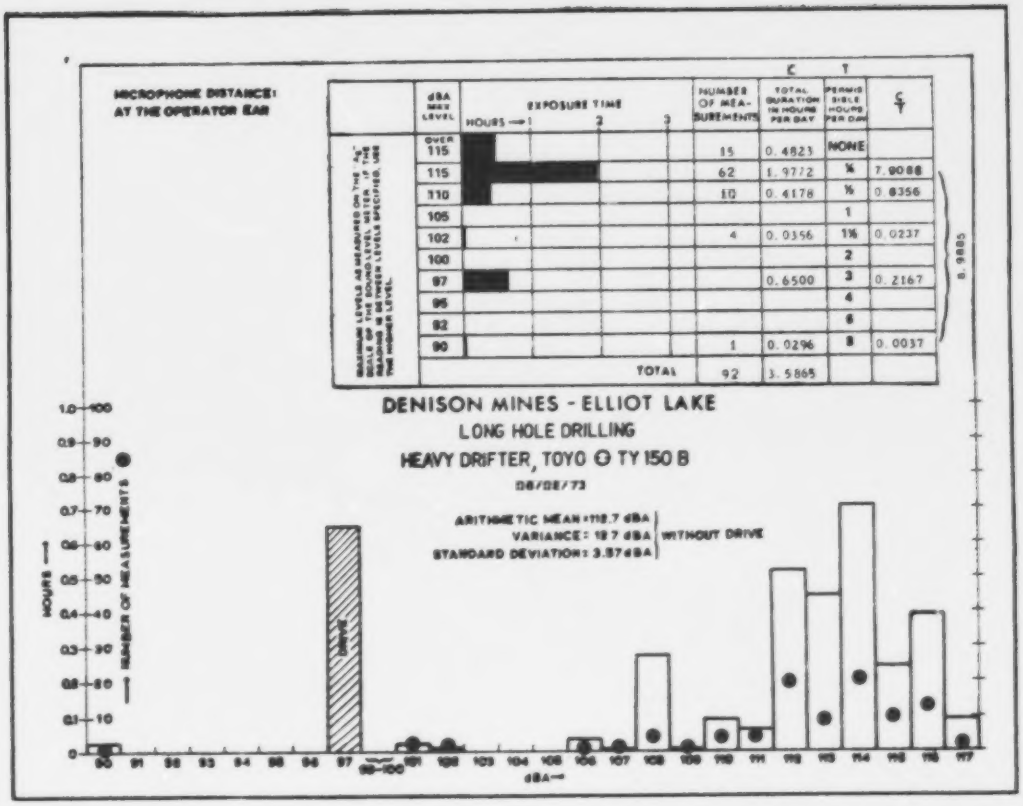


Figure 24: Drifter Operator Exposure Histogram (08/02/73).

DENISON MINES - ELLIOT LAKE — Long Hole Drilling. Drifter - Toyo Type 150B Data: 08/02/73.

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	360 - 379	Σ
90						1														1
92																				
95																				
97																				
100																				
102	1	1	2																	4
108																				
110	2	2			1		2				1	1						1		10
115	11	5	9	8	2	1	6	3	2	1		1	4	5	1	1	1		1	62
>115	1	2	3		1		2	2	1	1		1			1					15
Σ	15	10	14	8	4	2	10	5	3	2	1	3	4	5	2	1	1	1	1	92

Figure 25: Distribution of A-Weighted Sound Levels of Drifter Noises Sorted into Groups of Duration Times.

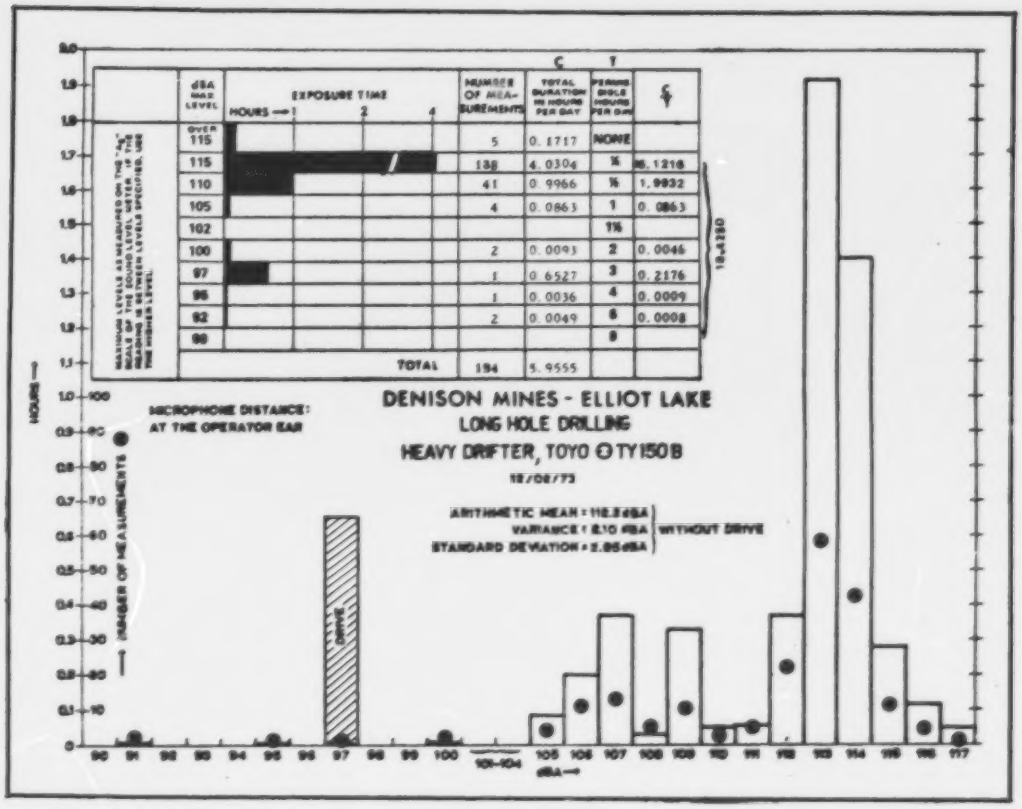


Figure 26: Drifter Operator Exposure Histogram (12/02/73).

DENISON MINES - ELLIOT LAKE — Long Hole Drilling, Drifter - Toyo Type 150B Data: 12/02/73.

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	360 - 379	380 - 399	Σ
90																					
92	2																				2
95	1																				1
97	1																				1
100	1	1																			2
102																					
105	1	1	1										1								4
110	4	10	8	4	3	1		2	3	2		1		2		1					41
115	9	31	11	17	16	5	9	7	3	9	2	7	2	4	3	1	1		1	1	138
>115			1				2	1		1											5
Σ	19	43	21	21	19	6	11	10	6	12	2	8	3	6	3	2	1		1	1	194

Figure 27: Distribution of A-Weighted Sound Levels of Drifter Noises Sorted into Groups of Duration Times.

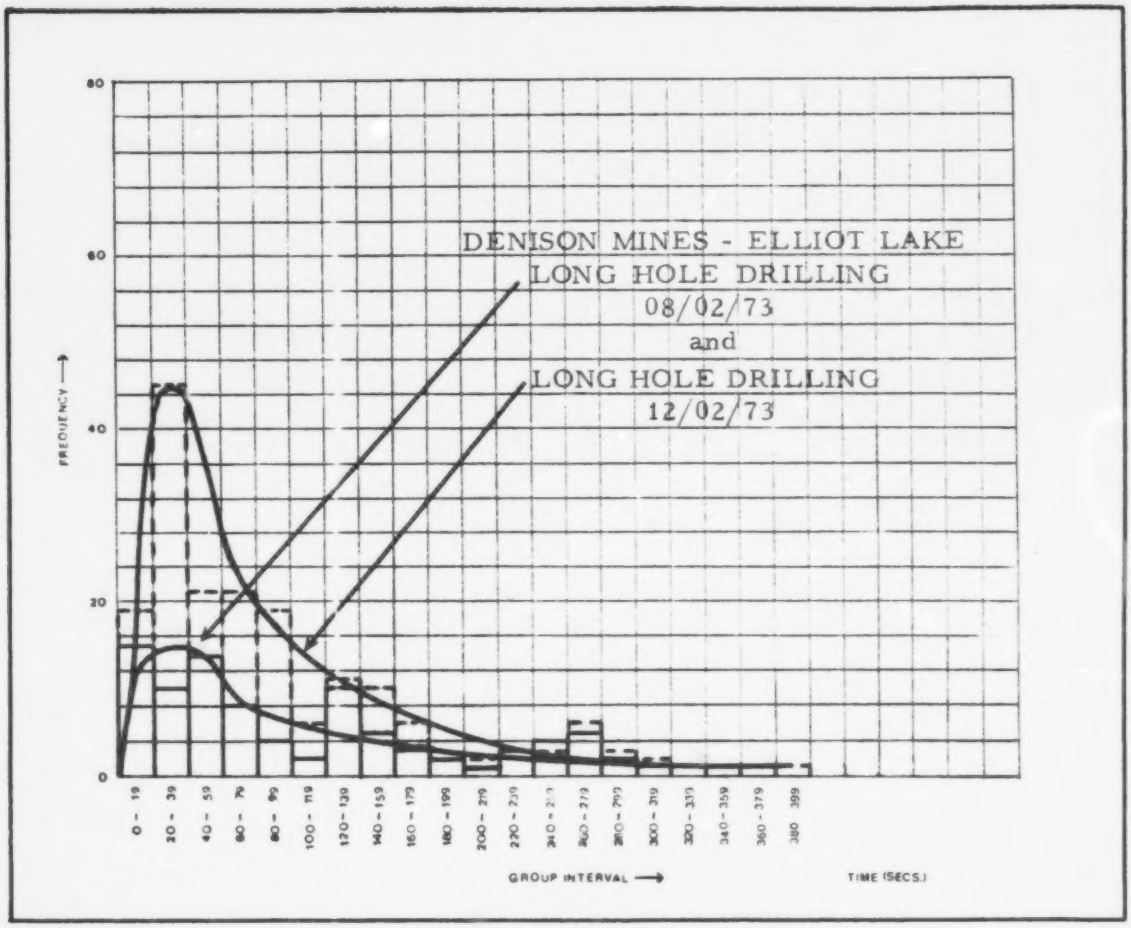


Figure 28: The Moderately Asymmetrical Frequency Curves of Operation Durations of Drifters.

The two moderately asymmetrical frequency curves of operation durations of drifters show the same tendencies (Figure 28). In this case it is clear that the noise is a function of the completed work. The comparison of results indicates that they are similar, even if the drifter was damaged - 08/02/73 - and produced more noise.

This example shows that, with partial measurement per unit depth of hole, the noise exposure for a full shift could be programmed.

3.5.5 Jumbo Drill (Figure 10, No. 5)

The test showed that the three-boom jumbo drill is the most dangerous machine for the miner's hearing. For over 4 hours, two miners are exposed to a noise over 115 dBA (Figure 29). The operator was operating the machine excellently, because the noise was compressed from 117 dBA to 119 dBA. The jumbo drill was operating continuously except for one short interruption to change the bit. For about 7 hours of work only 163 measurements were taken because the time intervals were longer (Figure 30).

The jumbo drill operator exposure histogram (Figure 29) shows two separate maximums: 93 dBA and 119 dBA. The first maximum was caused by the long waiting of the jumbo drill near the axial flow fan until the stope (working place) was cleaned and secured. This kind of delay is rare during the year.

This is a typical example where, along with administrative control, engineering control by a standard method for testing noise exposure can be successfully established.

The moderately asymmetrical frequency curve of operation durations of the jumbo drill is very similar to the curve of the heavy drifters (Figures 28 and 31).

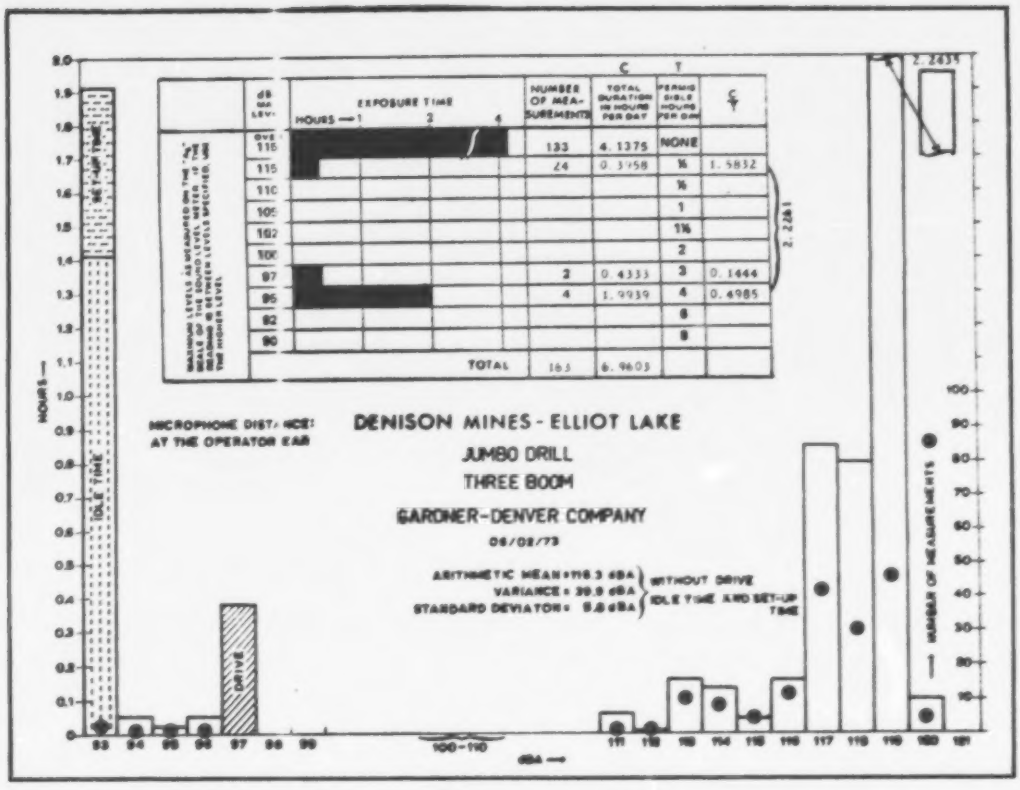


Figure 29: Jumbo Drill Operator Exposure Histogram.

DENISON MINES - ELLIOT LAKE — Jumbo Drill - Three Boom, GD Data: 06/02/73

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	360 - 379	380 - 399	400 - 419	900	1800	2400	5400	Σ
90																										
92																										
95					1					1												1		1	4
97					1																1				2
100																									
102																									
105																									
110																									
115	3	7	6	2	2	1	1		1		1														24
>115	11	29	19	17	9	6	12	10	1		3	3	4	2	1	1	1		1	1	1			1		133
Σ	14	36	25	19	1	7	13	10	2	1	4	3	4	2	1	1	1		1	1	1	1	1	1	1	163

Figure 30: Distribution of A-Weighted Sound Levels of Jumbo Drill Noises Sorted into Groups of Duration Times.

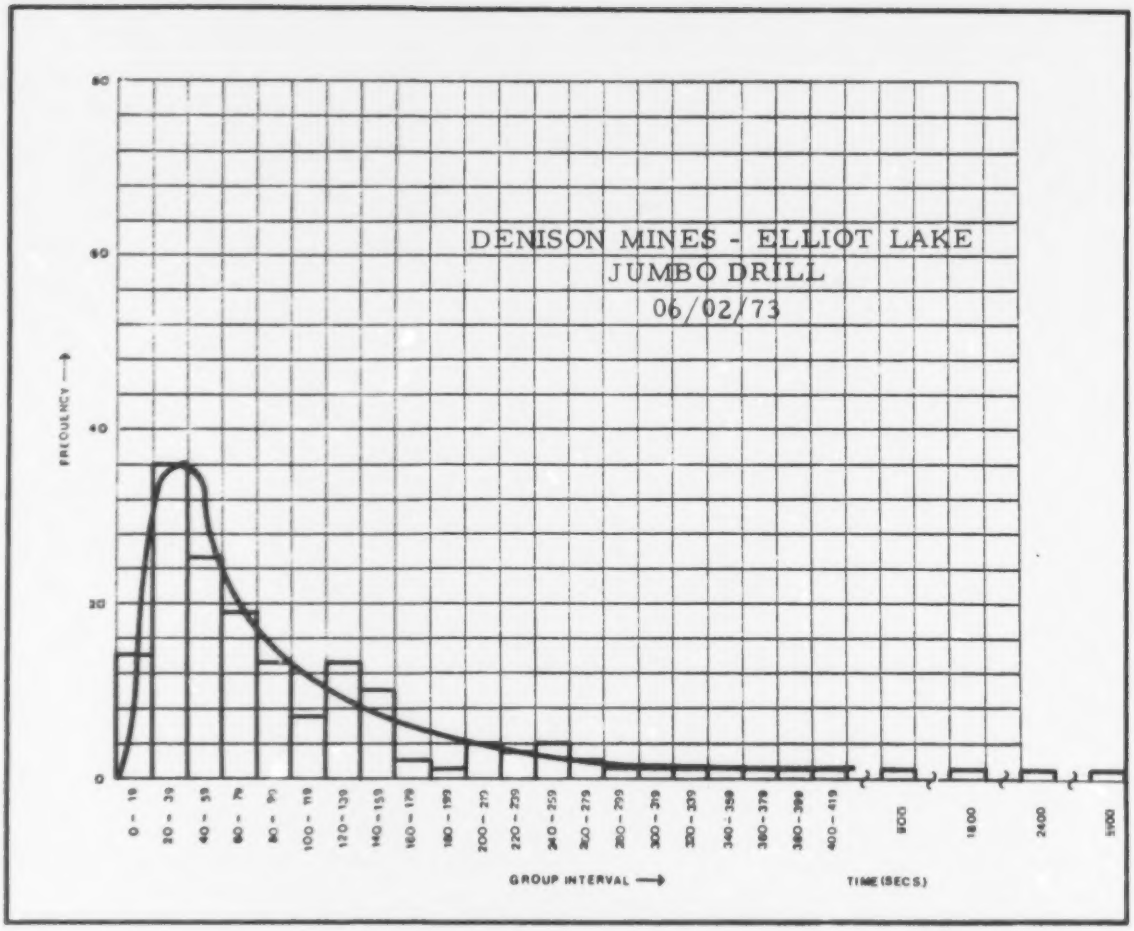


Figure 31: The Moderately Asymmetrical Frequency Curve of Operation Durations of the Jumbo Drill.

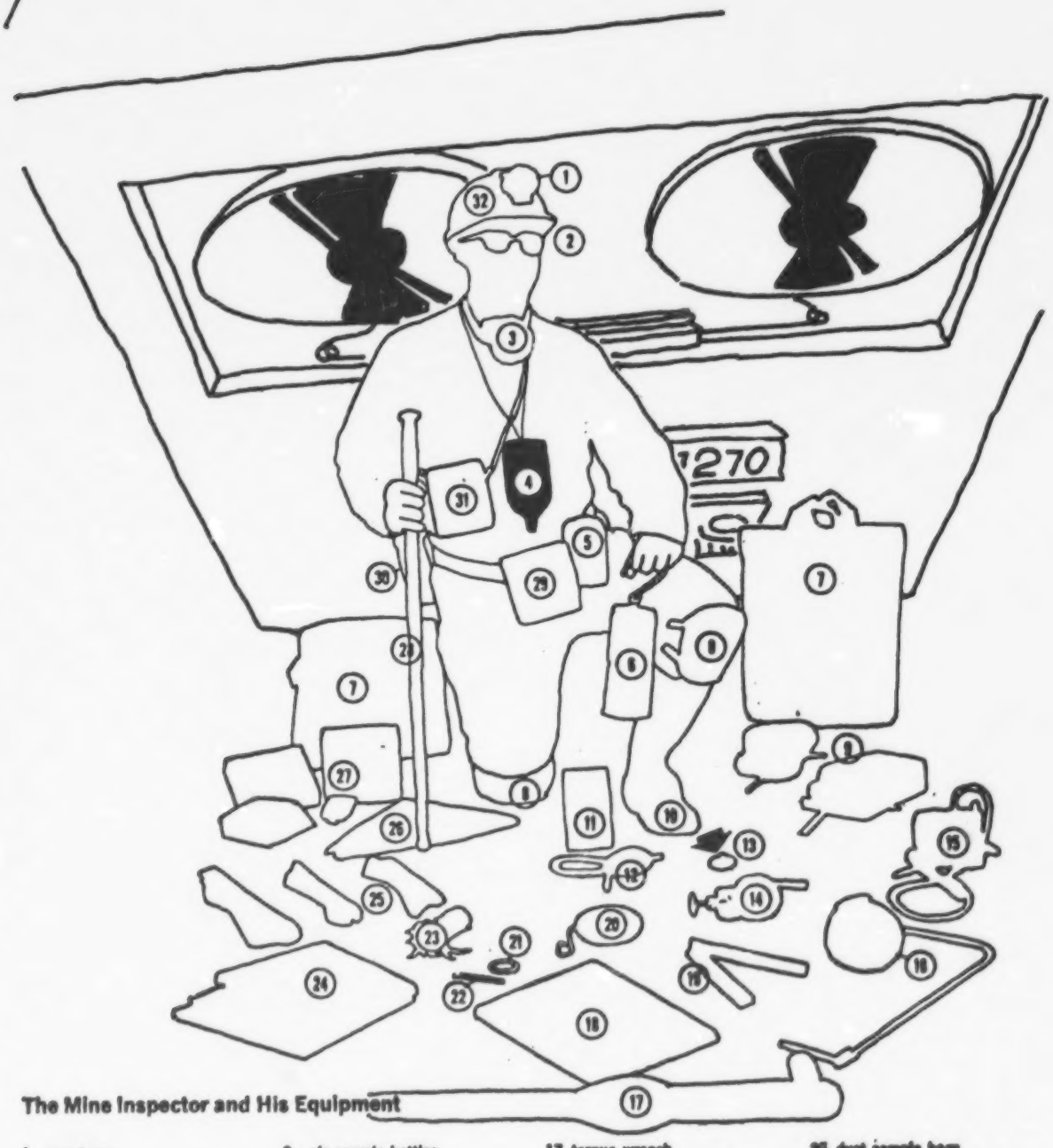
4. SIMULATION OF NOISE EXPOSURE IN MINES

With the current trends of increasing mechanization and drilling speeds, changing mining methods, improving safety, etc. and decreasing head grades, the mineral industry is no longer generally operating in high profit areas and has been obliged to pay greater attention to the application of modern technology (22), Figure 32. Mathematical modelling, though widely used in mining practice, for example in mine design, prospecting and transport, ventilation,(mineral processing) benefication, grinding, (metal processing) furnaces, rolling mills and production control, has not yet found much application in the mining environment. The economic aspects of noise studies also tend to complicate the issue (23).

Evaluation of an employee's exposure to noise in the mining industry is often difficult to carry out because of the nature of the work. The exposure pattern of these minera ordinarily changes from minute to minute. Since this program was started, several new noise dosimeters have been marketed. Unfortunately these newer instruments were not available for testing. They can only be used as accessory instruments in evaluating miner's exposure to noise.

If we were to use the noise dosimeter and suppose that it would give good results, according to this, the estimated probability, or empirical probability, of an event is taken as the relative frequency of occurrence of the event when the number of observations is very large. The statistical definition has difficulties in practice from a mathematical point of view, since an actual limiting number does not really exist. The construction of a new noise dosimeter would be a waste of time and would enlarge the list of instruments which by now has become heavy even for the mine inspector (Figure 32). The miner especially has to be freed of every needless load and to be directed exclusively toward production and his own safety.

This report was prepared to show the possibility of getting maximum use and best results with quick and simple measurements. Obviously this method can be accepted for evaluation in small mines with the use of a slide rule or in large mines by simulation. In principle, computer simulation is synthetic experimentation. In this way, many mining problems are estimated quickly and errors are non-catastrophic, providing an ideal learning situation. When the results are similar to those obtained in practice, great confidence can be attached to them. Simulation makes it possible to investigate noise exposure systems in mines which cannot easily be controlled in the natural environment.



The Mine Inspector and His Equipment

1 cap lamp
2 safety glasses
3 respirator
4 noise meter
5 self rescuer
6 flame safety lamp
7 utility bag
8 knee pads
9 air sample bottles
10 hard toed boots
11 smoke tubes
12 aspirator bulb & hose
13 stop watch
14 speed indicator
15 respirable dust sampler
16 pressure gage & pitot tube
17 torque wrench
18 notebook, pen & pencil
19 6-foot rule
20 measuring tape
21 drill bit gage
22 feeler gage
23 dust sample labels
24 notice & order forms
25 dust sample bags
26 dust sample mixing cloth
27 dust sample collecting kit
28 roof testing rod
29 anemometer
30 cap lamp battery
31 methane detector
32 hard hat

Figure 32: "Peut-on, à l'heure actuelle, entreprendre une analyse d'optimisation valable des mécanismes de l'exploitation minière (au moyen de programmations linéaires ou mathématiques)?" (23)

5. CONCLUSIONS

Short and very instructive measurements in Denison Mines showed that we have all types and classes of noise:

a) long continuous wide-band noise, e. g. fans;
b) short-term continuous narrow-band noise, e. g. drill hammers, drifters, and jumbo drills (Table 7);
c) short, intermittent variable-intensity impact or impulse noise, e. g. breakers;
d) intermittent variable-intensity noise, e. g. traffic and haulage.

The analysis of the results shows that the noise exposures can be separated into basic elements and the grade of the noise exposure can be foreseen. This means that with relatively short measurements the evaluation of noise exposures could be performed by simulation.

The analysis of equipment and measurement techniques in relation to the measurement results showed that for future measurements the principal instruments to be used will be:

- the sound level meter (standard method for testing noise exposure),
- the 166 Environmental Noise Classifier, and
- noise dosimeters: General Radio and Bendix as accessory instruments in evaluating a miner's exposure to noise.

The future measurement of noise exposures at Denison Mines, with the cooperation of the ventilation-environmental staff, will be evaluated by simulation. Denison Mines is a well organized and directed mine with great reserves and great capacity which was mentioned during the noise measurement. Because of this the evaluation of noise exposures by simulation is indispensable. With an increase of production, a change of parameters will take place and we will quickly have a new evaluation without additional measurements.

TABLE 7

Cumulative Distribution of A-Weighted Sound Levels of the Typical Machines in Denison Mines, Elliot Lake.

Seconds / dBA	0 - 19	20 - 39	40 - 59	60 - 79	80 - 99	100 - 119	120 - 139	140 - 159	160 - 179	180 - 199	200 - 219	220 - 239	240 - 259	260 - 279	280 - 299	300 - 319	320 - 339	340 - 359	360 - 379	> 380	Σ
Crusher I	53	29	25	21	13	11	10	6	4	4	2	2	3		1			1	1	4	190
Crusher II	11	43	39	26	18	10	5	3	4	1	2	3	2					1	1	1	170
Breaker	72	46	17	8	4	1	4		1		1		1							2	157
Hammer Drill	52	53	22	12	4	7	3	1													154
Drifter I	19	43	21	21	19	6	11	10	6	12	2	8	3	6	3	2	1			1	194
Drifter II	15	10	14	8	4	2	10	5	3	2	1	3	4	5	2	1	1	1	1		92
Jumbo Drill	14	36	25	19	13	7	13	10	2	1	4	3	4	2	1	1	1		1	6	163
Σ	236	260	163	115	75	44	56	35	20	20	12	19	17	13	7	4	3	3	4	14	1120
%	21.07	23.21	14.55	10.27	6.70	3.93	5.00	3.12	1.79	1.79	1.07	1.70	1.52	1.61	0.62	0.36	0.27	0.27	0.36	1.25	100.46
	58.53			20.90			9.91			4.56			3.75			0.9			1.61		

1 min → 58.83%

2 min → 79.73%

3 min → 89.64%

4 min → 94.20%

5 min → 97.95%

6 min → 98.85%

6. ACKNOWLEDGEMENTS

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VOL. 3 A Report 2

74 - 150 M. Savich, G Zahary and C. Fontaine

Preliminary noise survey at

a mine - smelter complex

1975

Relevé de bruit préliminaire à un complexe mine-fonderie

M. Savich*, G. Zahary**, C. Fontaine***

RÉSUMÉ

Un relevé de bruit préliminaire a été réalisé à un complexe mine-fonderie de métaux communs. Le bruit des machines, l'exposition des opérateurs, le bruit de fond et les niveaux de bruits généraux ont été mesurés dans différentes aires de travail. Un certain nombre de suggestions visant à réduire les dangers de l'exposition au bruit sont présentées.

Les foreurs souterrains sont exposés aux niveaux de bruit les plus élevés, 114 dBA, dont la moyenne pondérée en fonction du temps est de 108,7 dBA, et présentent le plus haut indice d'exposition au bruit, 12. On constate que les épurateurs des moteurs Diesel souterrains réduisent les émissions de bruit lorsqu'ils sont remplis d'eau. Les camions couverts utilisés pour la circulation du personnel se sont révélés relativement peu bruyants.

Bruit; mesure; mines; usines

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Les mesures réalisées sur trois camions de roulage dans des mines à ciel ouvert indiquent que le choix parmi différents camions peut être fait tant en fonction de l'intensité que de la fréquence du bruit produit. Les résultats indiquent que les conduteurs sont exposés dans leur travail à des doses de bruit voisines de la dose limite acceptable.

Le bruit de bande large continu dans la centrale électrique est de 93 dBA. Ce résultat indique que des appareils de protection de l'ouïe devraient être portés et qu'une cabine de protection devrait être construite.

On a mesuré des niveaux de bruit élevés à proximité des concasseurs (+100 dBA). Comme les soudeurs travaillant dans cette zone sont exposés à des niveaux de bruit de 95 à 100 dBA, du matériel de protection contre le bruit est requis.

Les niveaux de bruit dans les concentrateurs sont assez faibles, sauf à proximité des broyeurs à barres et à boulets (92 à 94 dBA) et des cellules de flottation (85 dBA). Des bouchons d'oreilles seraient suffisants.

Dans les fonderies, il existe des niveaux de bruit élevés en des points précis, et les travailleurs sont exposés de façon intermittente. D'autres études sont requises pour qu'on soit en mesure de définir une ligne de conduite en matière de protection contre le bruit.

On a aussi effectué des mesures dans les ateliers de menuiserie, les ateliers d'affûtage des taillants et les ateliers "steelox". Les niveaux de bruit mesurés sont élevés, mais d'autres études sont requises pour qu'on soit en mesure de déterminer des mesures appropriées.

On conclut qu'un programme de protection de l'ouïe devrait être mis sur pied afin de résoudre les problèmes les plus évidents et les études sur le bruit devraient continuer de fournir des données techniques qui justifieront les travaux portant sur les problèmes plus complexes.

Preliminary Noise Survey at a Mine-Smelter Complex

by

M. Savich*, G. Zahary**, C. Fontaine***

- -

SUMMARY

A preliminary noise survey has been made at a base metal mine-smelter complex. Measurements of machinery noise, operator exposure, background noise and general noise levels at a variety of work places have been made. A number of suggestions are made to control noise hazards.

Underground drillers are exposed to the highest noise levels, 114 dBA, time-weighted mean, 108.7 dBA, and have the highest noise exposure index, 12. It was observed that scrubbers on underground diesel engines reduce noise emissions when they are full of water. Covered trucks on manhaul duty were observed to be comparatively quiet.

Measurements on three open-pit haulage trucks indicate that there is a basis for choice between different trucks both with respect to the intensity and frequency of noise produced. Indications are that drivers are operating near the limit of their acceptable noise dose.

Steady wide-band noise in the powerhouse at 93 dBA indicates that hearing protection should be worn and that a protective booth should be built.

High noise levels were observed around the crushers (+100 dBA) and since the welders in this area are exposed to noise levels of 95 to 100 dBA, noise protection is required.

Noise levels in the concentrators are fairly low except around the rod and ball mills (92-94 dBA) and the flotation cells (85 dBA). Ear plugs

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Noise: Measurement: Mines: Plants
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would be satisfactory.

In the smelters high noise levels exist at specific locations and the workers are exposed intermittently. Additional work must be done to identify a noise protection policy.

Measurements were also made in the carpenter, bit grinding and steelox shops. High noise levels are observed but further investigation is necessary to choose an appropriate response.

It is concluded that a hearing conservation program should be organized to deal with the more obvious problems and noise studies should continue to generate technical data which will justify work on the more difficult problems.

CONTENTS

Summary ---------- i
Introduction ---------- 1
Mining-Industrial Noise ---------- 1
Noise Exposure Survey ---------- 4
Determination of dBA Reduction (R) ---------- 5
Experimental Results ---------- 8
- Underground Mine ---------- 8
- Open Pit Mine ---------- 10
- Power House ---------- 14
- Crushing Plants ---------- 14
- Concentrators ---------- 14
- Smelter ---------- 22
- Plant Engineering ---------- 22

Conclusions ---------- 28
Acknowledgements ---------- 28
References ---------- 29
Appendix: Plant Noise Survey Studies

FIGURES

1. Permitted Duration of Noise Level (Occupational Safety and Health Act, U.S.A.) ---------- 3

2. Underground Crushing and Conveying System and Location of Noise Measurements ---------- 9

3. Power House ---------- 15

4. No. 1 C.M. Crusher ---------- 16

5. No. 2 C.M. Crushing Plant ---------- 18

TABLES

1. Noise Levels in Underground Mine ---------- 11
2. Noise from Open Pit Haulage Trucks ---------- 13
3. Noise Levels in Power House ---------- 13
4. Noise Levels in No. 1 C. M. Crusher ---------- 17
5. Noise Levels in No. 2 C. M. Crushing Plant ---------- 19
6. Noise Levels in No. 1 Concentrator ---------- 20
7. Noise Levels in No. 2 Concentrator ---------- 21
8. Noise Levels in Roaster Plant ---------- 23
9. Noise Level in Reverb ---------- 24
10. Noise Levels at Converter ---------- 25
11. Noise Levels in Batching Plant and Waste Heat Boiler ---------- 26
12. Noise Levels in Acid Plant ---------- 27

INTRODUCTION

This study of noise sources at a base metal mining complex was carried out in cooperation with the mining company under the following general terms of reference:

- to demonstrate noise measurement procedures, to provide advice on instrumentation and to suggest control procedures where possible;
- to obtain quantitative but limited data on a selection of noisy working places;
- to identify areas where additional work should be done.

This report deals primarily with the latter two objectives.

MINING-INDUSTRIAL NOISE

Noise production in mines has been the subject of serious investigation in Canada since the early 1950's (1, 2). However, it is only recently that noise has been identified as a priority problem within industry generally, e.g., "During the 1960's engineers were primarily concerned with improving the power and productivity of equipment. During this decade, they will be primarily concerned with meeting safety and noise standards." (3).

Mining (industrial) noises are a complex mixture of several notes having their individual frequencies, intensities, and distribution in time. The different types of noise are:

a) steady wide-band noise, i.e. noise including a wide range of frequencies, e.g. general mining or machine shop noise;

b) steady narrow-band noise, i.e. the sound energy is concentrated in a few frequencies, e.g. hammer drills and circular saws;

c) impact or impulse noise, i.e. short duration impulses, e.g. tapping and hammering where changes in sound pressure level of 40 dB or more occur within 0.5 seconds;

d) steady-state (continuous) repeated impact noise where a change in sound pressure level is less than 40 dB between successive 0.5 sec intervals, e.g. rivetting and breaking;

e) intermittent noise where there are several periods of steady-state noise with intervals of ambient noise, e. g. traffic and drilling noise.

Using time and level as the measure, there are four classes into which occupational noise exposures may be grouped:

- long-term continuous noise,
- short-term continuous noise,
- intermittent equal-intensity noise, and
- intermittent variable-intensity noise.

The relevance of this is that some work has shown that miners exposed intermittently to intense rock drill noise showed no greater hearing damage than mill workers exposed to continuous noise 20 dB lower (4, 5).

The harmful effects of noise are well known and permissible exposure standards have been defined, Figure 1. Where standards are not legally binding or where noise levels are over the scale, these standards are a good guide for judgement. Because of long term secondary effects, e. g. cardovascular, gastrointestinal, psychological desease, these standards may change. In the meantime so little is known about the exposure of workers (quantitatively) in a typical mining operation and so few people are familiar with noise measurement and analytical techniques that much can be learned by using existing standards (6, 7).

Approaches to noise control are generally classified into three categories:

- personal protection, i. e. ear plugs, muffs, protective booths, etc.;
- administrative regulation, i. e. limit daily dose to that defined in standards;
- engineering design, i. e. eliminate, muffle, isolate or re-design noisy equipment.

These are listed about in order of increasing cost and desirability with respect to the quality of working environment.

Where occupational hazards exist it is logical to eliminate them directly. This can be done where the relationship between the hazard and the consequences are obvious, where the problems are simple or where solutions are either inexpensive or have already been tested elsewhere. Such conditions do not typically apply to noise hazards. In extreme cases all three control approaches might have to be applied before the problem can be brought under control. Hence some investment in appreciating the character of industrial noise, the methods of measuring and analyzing it will pay off in the long run.

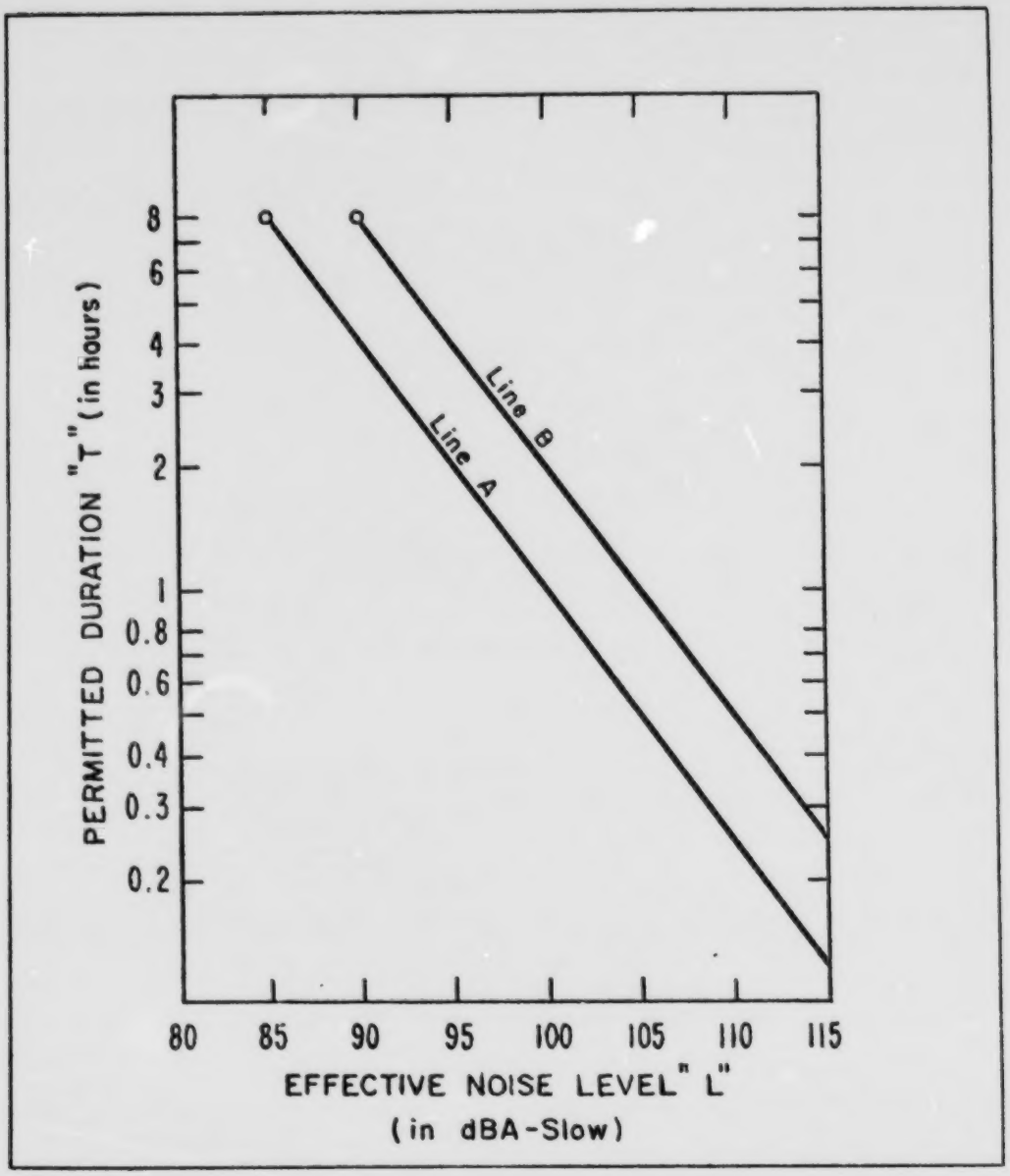

FIGURE 1: Permitted Duration of Noise Level (Occupational Safety and Health Act, U.S.A.).

Existing installations - Line B
New installations - Line A

NOISE EXPOSURE SURVEY

As a first step the noise exposure of various occupations can be determined. The exposure index provides a quantitative basis for classifying jobs, identifying those requiring attention, evaluating control methods or noise control programs, and making comparisons with other operations or industries where similar jobs are done.

In a large number of cases noise can be equated to work and the general principles of work measurement apply in measuring noise. The sound level meter is held close to the operator's ear and the duration of sound at different levels is recorded. This data is grouped to arrive at a total exposure time at various pressure levels. Total duration of exposure divided by the permissible exposure time as given by the code results in the exposure dose. This information is reported on a standard form that is widely recognized (OSHA) and permits easy communication of noise data. The noise exposure index should not exceed unity unless hearing protection is worn.

The quality of instrumentation and frequency of calibration are specified in standards and there should be no doubt as to whether proper equipment is being used (8). As in work measurement, the critical decision is whether the data obtained is representative of the job being studied. Since additional data is expensive and the amount of data needed varies with the character of the job, considerable judgement must be exercised by the observer. This is a key decision in any noise study.

The two most important properties of sound are its frequency and intensity. Frequency is the rate at which complete cycles of high and low pressures occur and is expressed in cycles/second (cps) or hertz (Hz). Intensity is the average rate at which sound energy is transmitted and is expressed as a "level" in decibels (dB) when measured above a standard reference pressure.

The human hearing system is effective over a very wide range; at moderate sound levels ($\sim$ 60 dB) frequency range is 20-20,000 Hz and sound pressures can be detected without pain over a range of 10^6 dynes/cm^2 which corresponds to a sound level range of 120 dB. Hearing sensitivity varies with sound intensity and frequency. At low sound levels sensitivity increases with sound frequency and reaches a maximum at about 3000 Hz. As sound level increases the efficiency of the hearing system becomes more uniform over a wider range of frequencies and, in particular, is more sensitive to low frequency sound.

Most sound level meters have three frequency-weighted scales -- A, B, C, and two response modes -- Fast and Slow. The slow response mode averages unsteady sounds and prevents rapid fluctuation of the meter needle. The A-frequency weighting is intended to represent the ear's response to low-level sound, e. g. conversational levels and below ($\sim$ 55 dB), and the C-scale represents the ear's response to high level sounds, e. g. above 85 dB. The scale and response mode are often shown in the measurement units, e. g. dBA - Slow.

Sound level measurements using these weighting scales represent the overall response of the human hearing system to sound. That is, the sound level at a particular frequency may be quite different than that registered by the meter. Sound levels for specific frequency ranges may be required in some cases, e. g. choosing hearing protection, analyzing equipment noise which has peculiar frequency characteristics. Such studies may be referred to as octave band or frequent spectrum analyses, spectral measurements, etc.

Several studies have been made to evaluate the efficacy of using A-weighted sound levels to assess noise exposure hazard. Botsford showed that of 580 industrial noises the A-weighted sound level indicated the hazard to hearing as accurately as did limits expressed as octave band sound pressures in 80% of the cases and was slightly more accurate in 16% of the cases (9). Passchier-Vermeer and Robinson found that sound level in dBA was as accurate as Noise Rating and better than other noise rating schemes which employed spectral measurement in octave bands (10, 11). Because of its accuracy and simplicity in rating hazard to hearing, the A-weighted sound level was adopted for assessing noise exposure by the American Conference of Governmental Industrial Hygienists (ACGIH) and in the Occupational Safety and Health Act (OSHA).

DETERMINATION OF dBA REDUCTION (R)

When ear protectors are required the noise reduction factor (R) must be determined. This is based on a knowledge of the attenuation of the ear protectors in octave bands and an A-slow sound level analysis of the noisy environment.

Calculation of dBA reduction factor, R, for ear protectors can be done as follows (12). The pure tone attenuation vs frequency characteristics of the ear protector (normally supplied by the manufacturer) should be determined in accordance with the American National Standard for Measurement of the Real-Ear Attenuation of Ear Protectors at Threshold, ANSI 224. 22 (1957). The Standard prescribes pure-tone tests at 125, 250,

500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz. We will also assume that the 4000 Hz octave band attenuation level can be obtained by averaging the pure tone attenuation levels at 3000 and 4000 Hz, and that the 8000 Hz octave band attenuation level can be obtained by averaging the pure tone attenuation levels at 6000 and 8000 Hz. This method has been formulated concisely of the Recommended Noise Standard, and also includes a factor of 10 which is to be subtracted to account for possible noise spectrum irregularities and noise leakage which might be caused by long hair, safety glasses, head movement, etc.

1. Evaluation of the pure tone attenuation supplied by the manufacturer:

   Let $Q_1, Q_2, \ldots, Q_7$ be defined (in dB) as follows:
   Q_1 = attenuation at 125 Hz, plus 16.2 dB,
   Q_2 = attenuation at 250 Hz, plus 8.7 dB,
   Q_3 = attenuation at 500 Hz, plus 3.3 dB,
   Q_4 = attenuation at 1000 Hz,
   Q_5 = attenuation at 2000 Hz, minus 1.2 dB,
   Q_6 = average of attenuation at 3000 and 4000 Hz, minus 1.0 dB,
   Q_7 = average of attenuations at 6000 and 8000 Hz, plus 1.1 dB.

2. The procedure to determine the dBA reduction (R):

   Let $L_1, L_2, \ldots, L_7$ denote the octave band levels in dB at 125, 250, 500, 1000, 2000, 4000, and 8000 Hz respectively, and let L_A denote the dBA-Slow level of the noise. Then the dBA reduction as corrected is given by $R = L_A - 10 \log S - 10.0$,
   where: 10.1 is the correction factor,

$$S = \text{antilog}(0.1 \times [L_1 - Q_1]) + \text{antilog}(0.1 \times [L_2 - Q_2]) + \text{antilog}(0.1 \times [L_3 - Q_3]) + \text{antilog}(0.1 \times [L_4 - Q_4]) + \text{antilog}(0.1 \times [L_5 - Q_5]) + \text{antilog}(0.1 \times [L_6 - Q_6]) + \text{antilog}(0.1 \times [L_7 - Q_7]).$$

3. If the octave band levels of the noise are not known, then the dBA reduction R may be computed simply as:

$$R = -10 \log S - 3.0$$

   where:

$$S = \text{antilog}(-0.1 \times Q_1) + \text{antilog}(-0.1 \times Q_2) + \text{antilog}(-0.1 \times Q_3) + \text{antilog}(-0.1 \times Q_4) + \text{antilog}(-0.1 \times Q_5) + \text{antilog}(-0.1 \times Q_6) + \text{antilog}(-0.1 \times Q_7).$$

   This calculation is approximate, and is based upon the assumption that the octave band levels are equal. For most types of noise it will give results close to those obtained by the more accurate method of (2) above.

Example:

Typical pure-tone attenuation characteristics of an ear protector:

125	250	500	1000	2000	3000	4000	6000	8000	Hz
					33	31	29	27	
24	21	23	29	30		32		28	dB
+16.2	+8.7	+3.3		-1.2		-1.0		+1.1	
$Q_1 = 40.2$	$Q_2 = 29.7$	$Q_3 = 26.3$	$Q_4 = 29.0$	$Q_5 = 28.8$	$Q_6 = 31.0$		$Q_7 = 29.1$		

If the octave band noise levels are not known, then

$$R = -10 \log S - 3.0$$

where:

S = antilog (-4.02) + antilog (-2.97) + antilog (-2.63) + antilog (-2.90) + antilog (-2.88) + antilog (-3.10) + antilog (-2.91)

or $S = 0.00811$.

Therefore, $R = -10 \log 0.0081 - 3.0 = 20.9 - 3.0 = 18$ dBA.

Now suppose the ear protector is to be used in an area with an environmental noise level of 95 dBA, for which the octave band noise levels are as follows:

125	250	500	1000	2000	4000	8000	Hz
99	94	94	90	84	82	75	dB

In this case the dBA reduction is:

$$R = L_A - 10 \log S - 10.0$$

where:

S = antilog (9.9 - 4.02) + antilog (9.4 - 2.97) + antilog (9.4 - 2.63) + antilog (9.0 - 2.90) + antilog (8.4 - 2.88) + antilog (8.2 - 3.10) + antilog (7.5 - 2.91).

so $S = 11,090,000$.

Thus $R = 95.0 - 10 \times 7.05 - 10.0 = 85.0 - 70.5$.

So $R = 14.5$ dBA.

EXPERIMENTAL RESULTS

Noise measurements were made in the underground and open pit mines and at various facilities on surface. The main purpose of the work was to define the scope of the noise problem and to recommend abatement procedures for the more obvious situations.

Underground Mine

Noise measurement sites are located in Figure 2 and the results are tabulated in Table 1. The table contains four different kinds of data, i.e. machinery noise, e.g. No. 5, 6, 9, 10, 14-20, etc.; operator exposure, e.g. No. 4, 23, 25; background noise, e.g. No. 3, 13; and general noise levels at different operations or sites, e.g. No. 1, 2, 11, 12. The measurement procedure is different for each type of data.

Mean noise levels above 100 dBA were recorded at the Symons cone crushers, vibrating feeder, No. 1 and 2 screens, and the jaw crusher. The operator is not necessarily exposed to these noise levels, e.g. compare data in No. 6 and No. 4. Background noise levels are low enough that they do not contribute to the exposure of the operator, i.e. data in No. 3 and 13. Background noise contributes to noise hazard only when it is within about 10 dBA of operating noise levels.

It does not appear to be practical to enclose the equipment or to isolate the operators in the underground crushing and conveying system. Accordingly operators should wear personal hearing protection.

The jumbo operator is exposed to the highest noise levels, i.e. 108.7 dBA. This is a time-weighted mean based on over 4 hours of measurement and no single measurement exceeded 114 dBA. In spite of the large rooms and heavy construction of the locally made jumbos, the noise exposure index for this operation is 12.5 which is very high (see Appendix). Jumbo operators should wear both ear muffs and ear plugs.

During the noise exposure study of the operator of the 35-ton Haul Pack, it was observed that the scrubber acts as a noise damper. During the first trip when the scrubber is full of water, noise levels vary in the range 93 to 101 dBA, while on the second trip noise increases into the range 95 to 108 dBA. The scrubber is filled every three trips. Since noise levels were fairly consistent on each similar trip, a reasonable estimate of the noise exposure index can be calculated from measurements on three trips and a count of trips made in a shift (Appendix).

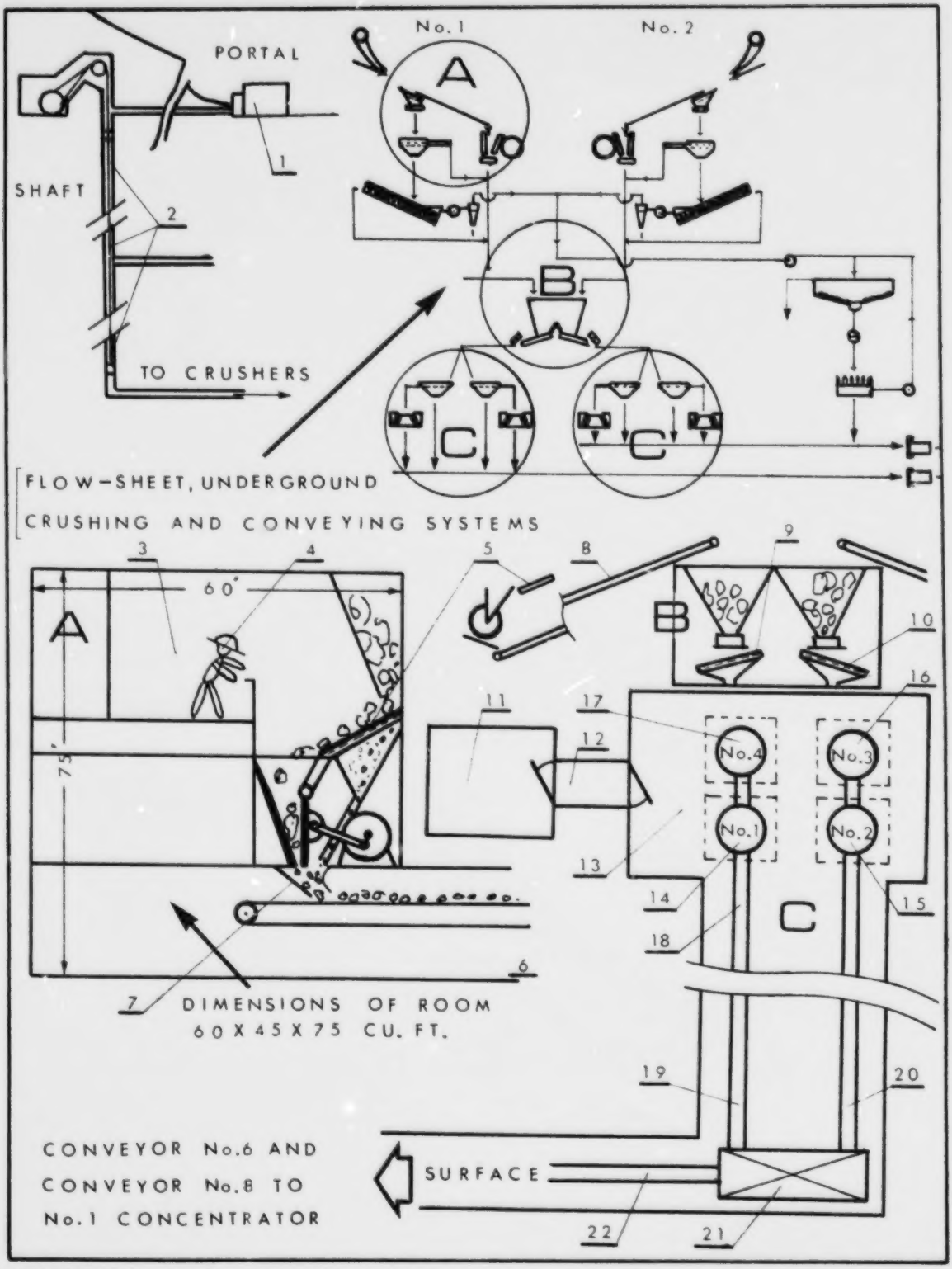

FIGURE 2: Underground Crushing and Conveying System and Location of Noise Measurements.

A similar effect was observed on the covered Ford 6000 diesel trucks used on man-haul duty. The noise levels observed, 83 to 90 dBA, are considered to be low in comparison to similar man-haul systems used in other mines. Because the scrubber appears to be so useful in reducing noise levels some additional work might be done to determine whether its performance in this regard can be further refined.

Noise levels in work shops, lunch rooms, etc. are low, 63 to 73 dBA, on the basis of this preliminary data. Some additional work should be done to validate this conclusion.

The mean noise levels in Table 1 are the average of a number of individual observations expected for the jumbo and haulage operations, No. 23 and 25. In these two cases it is a time-weighted mean which accounts for the duration as well as the level of noise. Finally, Table 1 contains a number of measurements on the dBC scale. The indicated noise level on this scale is somewhat higher in all cases. Since this scale is more sensitive to lower frequency sound, the results indicate the proportion of low frequency sound in the noise being measured, e. g. see data on belts and bin No. 18 to 22. Low-frequency noise is generally more difficult to control.

Open Pit Mine

Noise production by haulage trucks was measured on parked vehicles with engines at idle and wide open and the results are shown in Table 2.

At the standard distance of 50 feet from the truck the data show highest noise levels at the rear with all trucks performing equally well. With the throttle wide open peak noise level shifts to the sides and front. The Wabco 120B produces the most noise (89 dBA) and the Wabco 50 is as noisy as the larger Electra Haul, 84 dBA. Measurements on the C-scale indicate that noise from the Electra Haul is made up of a large amount of low frequency sound, 80 dBA vs 114 dBC on the right side, W. O. T.

Measurements in the cab at the driver's seat indicate that the Wabco 120B is the quietest vehicle and the Wabco 50 the noisiest although not significantly different than the Electra Haul. The C-scale measurements suggest that in-cab noise has a large low-frequency component.

Noise produced by the Electra Haul during unloading at the No. 2 Crushing Plant was measured at a distance of 30 feet. The unloading cycle takes 10 to 15 seconds and the noise produced varies in the range 95 to 106 dBA. When tire noise and other extraneous noise are accounted for the driver may be operating at the acceptable dose limit for a shift. More detailed measurements are required to justify further sound-proofing

TABLE 1

Noise Levels in Underground Mine

No	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Mine change house									
	20/8/74	58	74	65.7	0.3	120				
	21/08/74	55	77	63.8	0.2	320				
2	Shaft	61	74	67.1	0.9	18				
3	No. 1 Jaw Crusher Room - background noise			61		1			79	
4	No. 1 Jaw Crusher at operator's ear	90	112	97.6	0.5	81				
5	Vibrating Feeder			106		1			114	
6	No. 1 Jaw Crusher (distance 3 ft)	97	104	100.5		4				
7	Between crusher and belt	98	102	100		6				
8	Belt			80		1			108	
9	No. 1 Screen	103	105	104		4	109	109	109	
10	No. 2 Screen	102	103	102		4	109	110	109	
11	Transformer station	65	68	67		3	77	80	79	
12	Lunch Room (crusher off) - open door	62	65	63.2		6	72	74	73	
13	Cone Crusher (Symon's) room - background noise			71		1			81	
14	Symons No. 1	104	107	104.9	0.4	8	108	114	110	0.7
15	Symons No. 2	105	107	106.1	0.3	8	109	110	109.8	0.2
16	Symons No. 3	104	108	105.4	0.5	8	109	110	109.6	0.2
17	Symons No. 4	104	108	106.3	0.5	8	109	112	110.5	0.4
18	Belt No. 1			83		1			101	
19	Belt No. 2			81		1			100	
20	Belt No. 2			81		1			100	
21	Bin			88		1			106	
22	Main Belt			84		1			103	
23	Jumbo #311 two-boom, at operator's ear	90	114	108.7	0.05	Time 4:33				
24	Large Lunch Room	64	88	73.2	0.4	204				
25	Haul Pack Truck, 35-ton	82	108	89.5	0.05	Time 1:16				

TABLE 1
cont'd

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
26	Truck, Ford 6000 Departure 20/08/74	68	92	83.5	0.3	214 139	91	106	99.9	0.2
27	Truck, Ford 6000 Arrival 20/08/74	82	95	89.9	0.4	57 81	94	104	101	0.2
28	Truck, Ford 6000 Departure 21/08/74	80	98	87.6	0.3	222				
29	Truck, Ford 6000 Arrival 21/08/74	80	104	90.8	0.6	182				

TABLE 2

Noise from Open Pit Haulage Trucks

Position		Wabco 50		Electra Haul		Wabco 120B	
		Idle	WOT*	Idle	WOT	Idle	WOT
Front - 50 ft	dBA	65	80	69	84	70	86
	dBC	83	87	84	96	83	96
Right Side - 50 ft	dBA	68	84	74	80	71	89
	dBC	82	89	91	114	85	96
Rear - 50 ft	dBA	74	78	75	79	74	86
	dBC	89	91	91	91	89	98
Left Side - 50 ft	dBA	67	81	69	80	72	88
	dBC	83	86	84	87	87	94
In Cab Open Window	dBA	72	88	81	88	68	83
	dBC	97	96	115	110	96	106
Closed Window	dBA	70	87	80	85	66	79
	dBC	98	95	113	107	94	100

* WOT - Wide open throttle.

TABLE 3

Noise Levels in Power House

No.	Location/Operation	dBA				No. Samp	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Boiler room	81	88	83.8	0.3	41	92	95	93.3	0.1
2	Boiler room, operator area	83	88	85.2	0.4	14	93	95	93.6	0.2
3	Boiler room, stage 1 1/2	84	85	84.5		2	93	94	93.5	
4	Operating room	88	97	92.8	0.2	92	93	100	96.8	0.2
5	Switch room, - open door			85		1			90	
	- closed door			71		1			81	

of the cabs as this can be very expensive.

Power House

Noise levels were measured along two paths which operators commonly use in the boiler and operating rooms, Figure 3. In the boiler room mean noise levels are acceptable, 85 dBA or less, Table 3.

The compressors are the main source of noise in the operating room since the diesel and turbo generators are only on standby duty. Minimum noise levels were observed at the diesel generator (89 dBA) and maximum levels at the compressors (97 dBA) for a mean noise level of 93 dBA. Steady, wide band noise at 93 dBA represents a noise hazard and it is suggested that a sound-proof enclosure be constructed for the operator. Standard sound-proof enclosures are commercially available and there should be no difficulty in obtaining one of suitable size.

Crushing Plants

In spite of care taken in the design of the No. 1 and No. 2 crushing plants, high noise levels were measured at some points, see Figures 4 and 5 and Tables 4 and 5. Noise levels are generally higher in No. 2 than in No. 1 plant and in both plants the welders are in the least favourable position.

Noise levels in all rooms in both plants are of the order of 90 dBA with the doors open. Automatic door closers would contribute to the reduction of noise levels in these rooms.

In both plants the welders are in the least favourable position. In the No. 1 plant there is a quiet area near the main door (95.2 dBA, Table 4) and in the storage area with the door closed (82.5 dBA). Exposure of the welders might be reduced somewhat by organizing work near the door and the storage room is an indication of what might be achieved by enclosing the welding area. It is difficult to provide hearing protection for welders because the face mask must be removed so frequently to change electrodes. A noise exposure index for this occupation was not obtained but indications are that the welders must wear some form of hearing protection.

Concentrators

Noise levels in the concentrators are not high except in the vicinity of the rod and ball mills (92 to 94 dBA) and flotation cells (85 dBA). The building is filled with noise of approximately the same level and the workers should wear ear plugs, Tables 6 and 7.

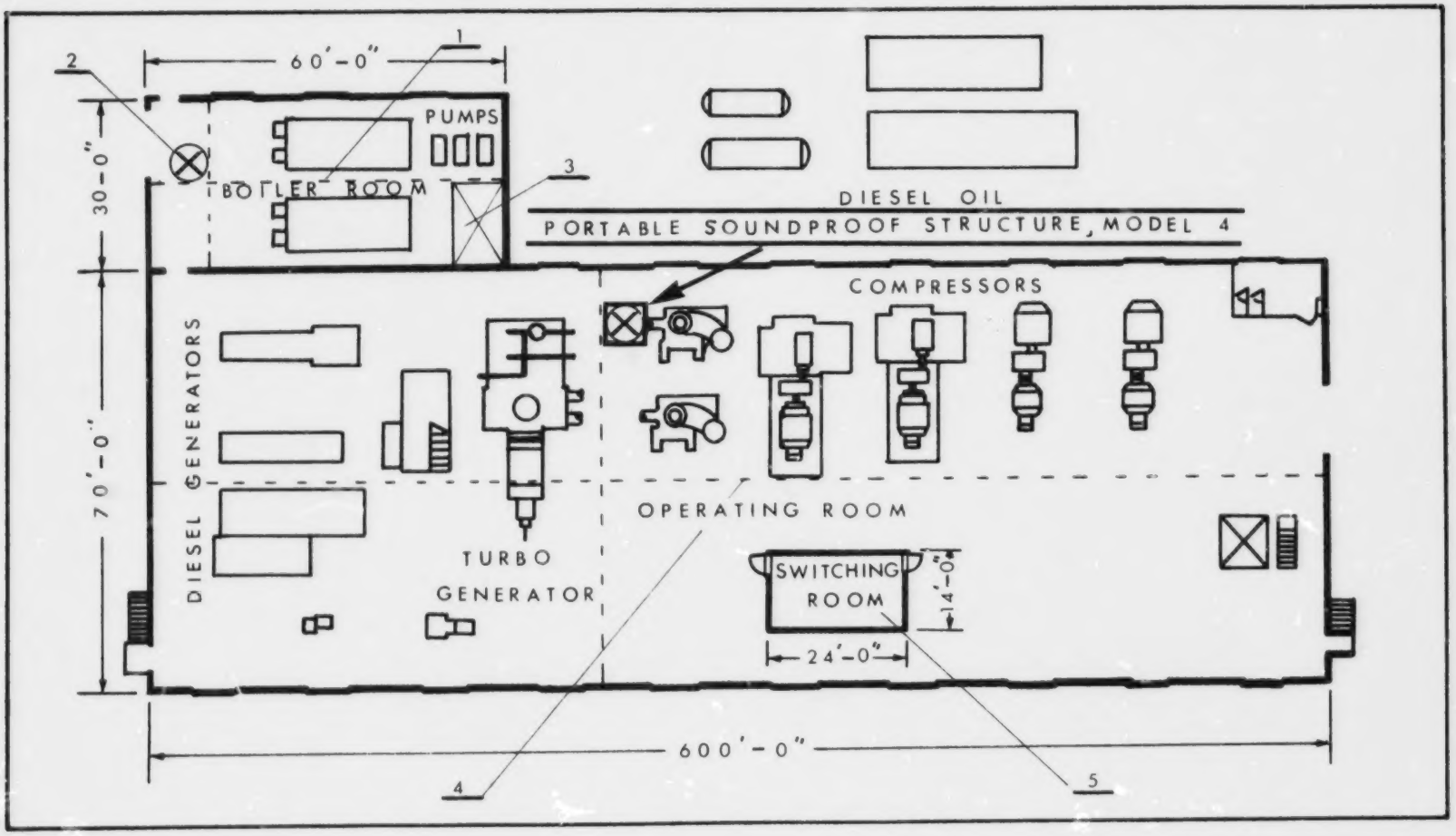

FIGURE 3. Power House.

⊗ Main Operators Area. ---- Noise Measurement. \No. Location/Operation.

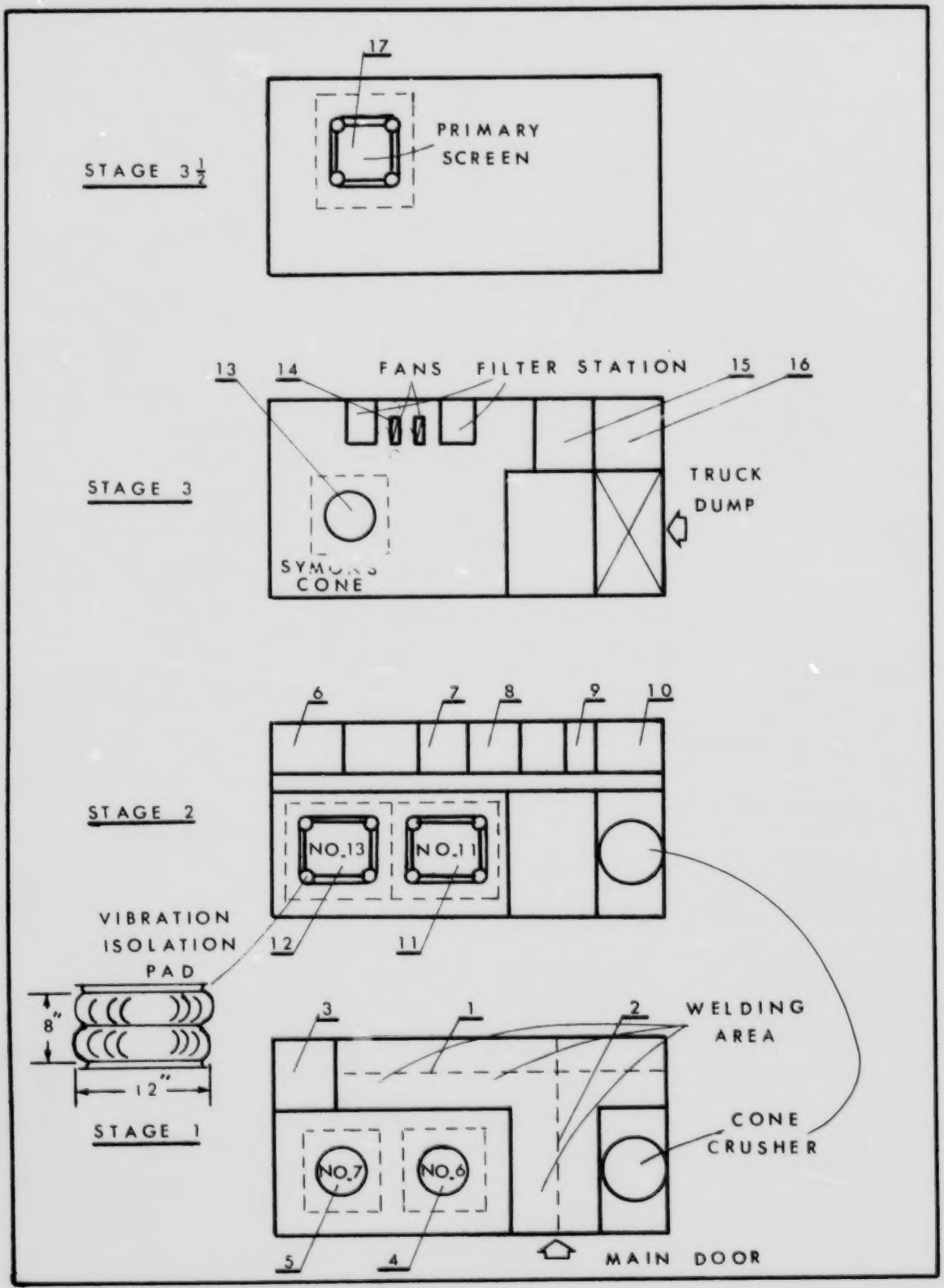

FIGURE 4: No. 1 C. M. Crusher.

TABLE 4

Noise Level in No. 1 C. M. Crusher

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Welding Area	97	101	99.9	0.2	35	102	106	104	0.2
2	Welding Area, opposite door	94	97	95.2	0.2	17	98	101	99.7	0.2
3	Storage - open door	89	90	89.5		1	95	103	99	
	- closed door	82	83	82.5		1	94	100	97	
4	Symon's No. 6	101	103	102.6	0.5	8	104	105	105.6	0.4
5	Symon's No. 7	102	105	103.4	0.6	8	106	108	106.9	0.4
6	Change Room (locker)									
	- open door			90		1			98	
	- closed door			82		1			96	
7	Shift Boss - change									
	room - open door			88		1	110	116	113	
	- closed door			83		1	105	114	109.5	
8	Mechanic Shift-Boss									
	- open door			99		1			108	
	- closed door			80		1	95	102	98.5	
9	Washroom -									
	- open door			92		1			112	
	- closed door			79					92	
10	Switch Room,									
	- open door			89		1			93	
	- closed door			78		1			82	
11	Screen No. 11	98	102	98.8	0.2	27/54	103	119	109.6	0.7
12	Screen No. 13	98	100	98.9	0.1	27/54	105	119	110.8	0.7
13	Symon's Cone	105	110	107.5	0.6	8	108	112	109.1	0.5
14	Fan	92	96	94.5		4	100	102	101.2	
15	Platform	97	98	97.5		1			101	
16	Operator's Room									
	- open door			91		1			96	
	- closed door			79					89	
17	Primary Screen	99	102	100.9	0.1	35	103	111	106.7	0.4

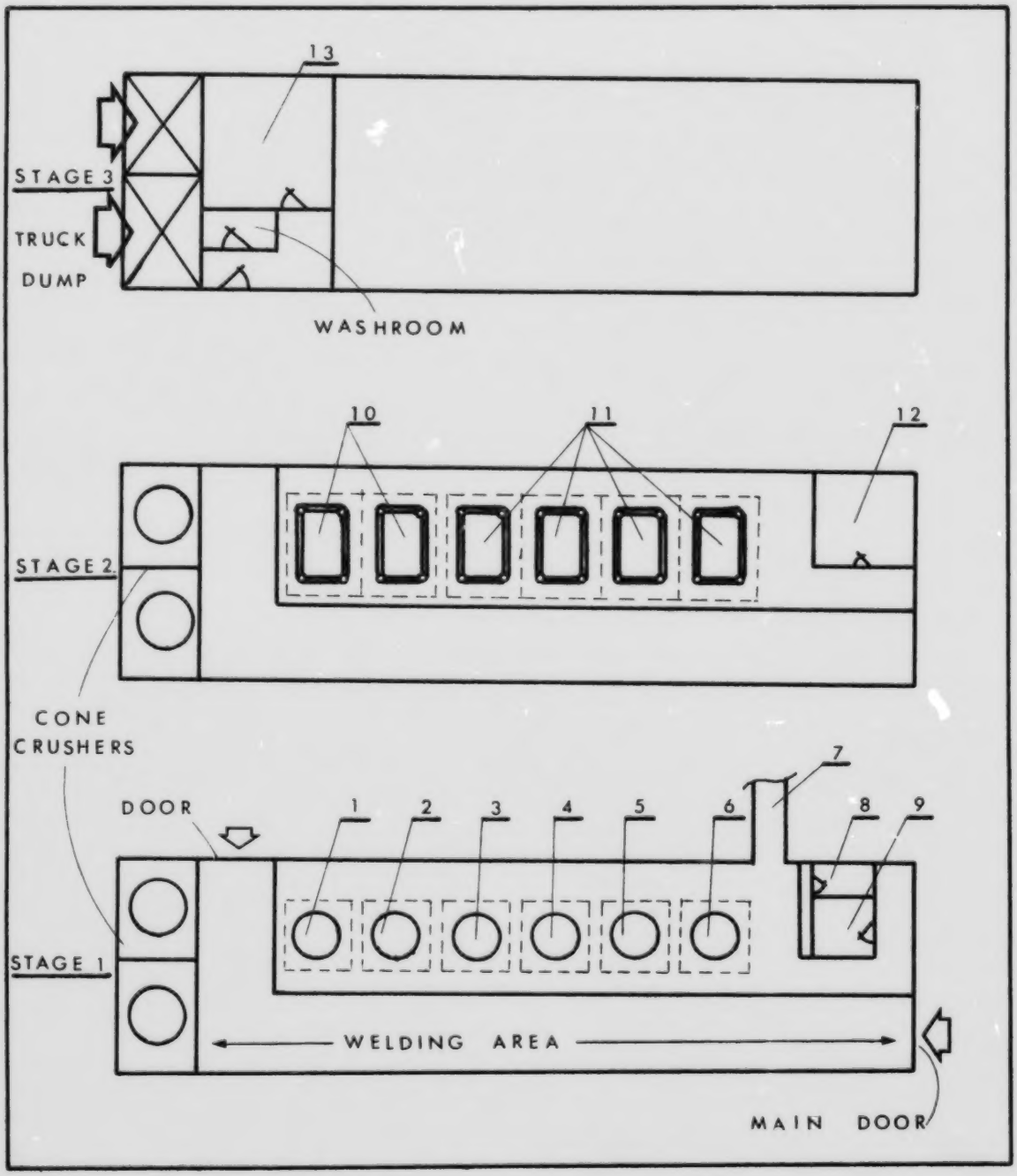

FIGURE 5: No. 2 C. M. Crushing Plant.

TABLE 5

Noise Level in No. 2 C. M. Crushing Plant

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	No. 1 Symon's	105	109	106.9	0.5	8	108	110	109.1	0.3
2	No. 2 Symon's	107	110	108	0.3	8	109	110	109.5	0.2
3	No. 3 Symon's	107	108	107.1	0.1	8	108	111	109.6	0.3
4	No. 4 Symon's	106	108	107	0.3	8	108	113	110.1	0.6
5	No. 5 Symon's	106	109	107.7	0.3	8	110	112	110.5	0.3
6	No. 6 Symon's	106	108	107	0.3	8	109	111	109.9	0.3
7	Belt			90		1			99	
8	Office - closed door			76		1			87	
9	Lunch Room,									
	- closed door			78		1			87	
10	2 Screens	100	108	104	0.3	44	105	111	107.2	0.3
11	4 Screens	98	105	102	0.2	110	101	117	107.6	0.3
12	Storage,									
	- open door			92		1			97	
	- closed door			84		1			95	
13	Operator's Room,									
	- open door			91		1			94	
	- closed door			77		1			86	

TABLE 6

Noise Level in No. 1 Concentrator

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Area of rod and ball mills	93	94	93.5		10	100	101	100.5	
2	Flotation cells at distance from mills 20 - 30 ft			91		1			100	
3	Flotation cells at distance from mills 30 - 50 ft			88		1			98	
4	Flotation cells at distance from mills > 50 ft			84		1			95	
5	Laboratory	67	74	70		2	77	79	78	
6	Offices									
7	X-ray rooms									
	1st room,									
	- open door			81		1			89	
	- closed door			67		1			85	
	2nd room,									
	- open door			73		1			85	
	- closed door			67		1			85	
8	Highest stage	88	89	88.5		6			98	
9	Lunch room,									
	- open door			82		1			92	
	- closed door			75		1			91	
10	Transformer station			74		1			82	

TABLE 7

Noise Level in No. 2 Concentrator

No.	Location/Operation	dBA					dBC			
		Min.	Max.	Mean	Std. Dev.	Samp.	Min.	Max.	Mean	Std. Dev.
1	Area of rod and ball mill	92	94	93	0.3	20	99	102	101	0.5
2	Basement of rod and ball mill	91	93	92	0.2	10	101	105	103	0.7
3	Laboratory			70		1			83	
4	Operator's room, com. table	66	70	68		2/1			85	
5	Storage	74	75	74.5		2/1			84	
6	Office			70		1			83	
7	Cu flotation cells	84	87	85	0.4	23	93	96	94	0.3
8	Mo flotation cells	83	87	85	0.6	6	94	96	95	0.2
9	Basement under Cu and Mo flotation cells	85	87	83	0.3	5	95	98	96	0.4

Smelter

The noise survey at the smelter area is informative. Tables 8, 9, 10, 11, and 12 show noise levels at different locations. The workers are in constant motion passing high noise sources and stopping for shorter or longer times. Some machines produce high noise levels but nobody works around these for long periods, e. g. roaster plant feeder (105 dBA), or around the precipitation hoppers (103 dBA) in the blower room (110 dBA), etc. On the basis of measurements taken, it is estimated that the punching operator is exposed to the highest noise level during work. Exposure index was 3. 3 during 8 hours of work (Appendix). It is necessary to perform more tests in different working places at the smelter area and make a detailed analysis.

The batching plant was not working and, for that reason, was not completely tested. In the basement of the waste heat boiler the lunch room is located beside pumps and compressors and the noise level is 86 dBA (Table 11). It is necessary to separate the lunch room by an acoustical panel from the pumps and compressors or to relocate it.

In general, noise levels are low and it is sufficient to use ear plugs. Only one working place requires special protection, that is the punching operation.

Plant Engineering

Two shops were tested: Steelox and the carpenter shop(13). The steel-cleaner is exposed to high noise, 106 dBA, which can be isolated by a standard sound-proof enclosure. Also for the bit-sharpener a sound-proof enclosure can be constructed. This design is somewhat more complicated, requiring grindstone and bit dimensions, the worker's position and information on his movements. The noise level at the bit-sharpener's ear is 94 dBA and 103 dBC.

In the carpenter shop the main source of noise is at the saws (operator ear - 96 dBA and 108 dBC). Before undertaking any steps for making a sound-proof enclosure the following have to be examined: time of use, noise levels, wood and saw dimensions. On the basis of this data an enclosure can be constructed.

TABLE 8

Noise Levels in Roaster Plant

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Safety Office									
	- open door			70		1			86	
	- closed door			70		1			86	
2	Change room (locker)									
	- open door			67		1			79	
	- closed door			65		1			77	
3	Lunch room									
	- open door			69		1			85	
	- closed door			70		1			86	
4	Clerk office									
	- open door			82		1			85	
	- closed door			66		1			69	
5	Operator's room									
	- open door			80		1			87	
	- closed door			70		1			84	
6	Supervisor's room									
	- open door			79		1			82	
	- closed door			64		1			69	
7	Feeder (3 ft distance)			105		1			107	
8	No. 2 table feeder (4 1/2 floor, No. 7 off)			90		1			94	
9	No. 3 primary cyclone valve (No. 4 off)			93		1			97	
10	Secondary cyclone valve	90	92	91		2	94	98	96	
11	Around precip. hoppers (4th floor)			103		1			103	
12	North roaster drag (3 1/2 floor, south off)			89		1			97	
13	Airdust system (3rd floor)			103		1			102	
14	Transformer room									
	- closed room			70		1			84	
15	Roaster vacuum	89	96	91.3	1.0	7	95	98	96	0.4

TABLE 9

Noise Level in Reverb

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Fettling drag conveyor - 1st	89	92	91.4	0.3	10	94	100	99.2	0.6
2	Fettling drag conveyor - 2nd	91	94	92	0.2	12	98	101	99.5	0.2
3	Slag			91		1			100	
4	Burner			92		1			99	
5	Matte			88		1	99	100	99.5	
6	Fan			90		1			101	
7	Grinding Machine at operator's ear			92		1			95	
8	Outside blower room			92					95	
9	Blower room	108	111	109.9	0.3	9	110	116	112.5	0.7
10	Workshop									
	- open door			66		1			76	
	- closed door			72		1			80	
11	Change house (lockers)									
	- open door			70		1			85	
	- closed door			65		1			85	
12	Electrical room			101		1			103	
13	Storage									
	- open door			73					83	

TABLE 10

Noise Levels at Converter

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Beside flux feeder, at 3 ft			97		1			100	
2	Beside punching operator at ear	90	115	95.2	0.1	1			111	
3	Platform in front of converter			86						
4	Anode casting wheel cab	82	84	83		1	100	102	101	
5	Back of the new anode	89	92	91		3	100	104	102	
6	Rotary anode, beside compressed air inlet			94		1			103	
7	Floor in front of anode furnace			96		1			107	
8	Converter control room									
	- open door			76		1			87	
	- closed door			68		1			85	
9	Lunch room									
	- open door			77		1			92	
	- closed door			73		1			86	
10	General foreman's room			66		1			86	

TABLE 11

Noise Levels in Batching Plant and Waste Heat Boiler

No.	Location/Operation	dBA				No. Samp.	dBC			
		Min.	Max.	Mean	Std. Dev.		Min.	Max.	Mean	Std. Dev.
1	Grinding machine without load:									
	1st grinder									
	- distance 3 ft			98		1			100	
	2nd grinder									
	- distance 3 ft			90		1			93	
2	Foreman's room (batching plant off)									
	- open door			68		1			84	
	- closed door			68		1			90	
3	Waste heat boiler: operator's room			83		1			87	
4	Basement with electric feed, pumps and compressors:									
	- pumps			92		1			94	
	- compressor			92		1			92	
5	Lunch room			86		1			94	

TABLE 12

Noise Levels in Acid Plant

No.	Location/Operation	dBA					dBC			
		Min.	Max.	Mean	Std. Dev.	Samp.	Min.	Max.	Mean	Std. Dev.
1	Outside blower room			98					99	
2	Blower room (preheater not running) - open door	100	104	102.5	0.5	8	102	106	104	0.6
3	Blower room (outside inlet duct)			99		1			100	
4	Control room									
	- open door			85		1			88	
	- closed door			75		1			80	
5	Strong acid building			85		1			91	
6	Office			68		1			75	
7	Pipe fitter's shop (under mist precip.)			82		1			86	
8	Weak acid building			88		1			91	
9	Cooling tower pump house	93	96	94.6	0.5	5	97	99	98	0.3

CONCLUSIONS

A wide-ranging study of work sites where noise could be a hazard has been made. No one site was studied in detail and supporting data is necessarily limited.

However, enough information is available to demonstrate that a hearing conservation program is justified. The first steps would be to provide hearing protection for employees exposed to noise levels above 90 dBA, to install commercially available noise enclosures where practical, and to begin a program of audiometric testing. This can be followed up by more detailed studies of work places which have only been briefly surveyed here and of occupations where the noise dose or noise exposure index appears to be excessively high.

The jumbo operator is exposed to the highest noise levels, 114 dBA, and has the highest noise exposure index, 12.1. These results were obtained in an opening that was already at full height. In a more confined space the index could be higher and the maximum permissible noise level, 115 dBA, exceeded. A significant reduction in noise level at this work place will require considerable expense and technical skill. Such a program could not be undertaken without a more reliable specification of the scale of the problem, e.g. effect of opening dimensions, location of intersections, number of machines operating, changes in work cycle, etc.

From another perspective, the No. 1 crusher, power house and steelox could be studied more intensively with a good possibility that the working environment could be improved in these areas.

ACKNOWLEDGEMENTS

Michel Lefebvre, Superintendent of Mines, Gaspe Copper Mines Ltd., participated in the development of the project. Pierre Boudreault, Chief Mine Engineer, assisted in selecting sampling sites. The members of the environmental staff, S. Ghoneim, environmental engineer, and M. Moran, ventilation technician, participated in one-part measurements. R. Tervo, Research Scientist, gave useful advice during the development of the project, and R. Regan provided technical assistance; both are with the Elliot Lake Laboratory.

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APPENDIX

PLANT NOISE SURVEY STUDIES

for:
1. Jumbo Operator
2. Underground Haulage Truck Operator
3. Converter Punching Machine Operator.

ELLIOT LAKE LABORATORY, MINES BRANCH, EMR

Plant-Noise Survey Form

DATE: AUGUST 21/74
METER #: B+K 2205

LOCATION: GASPÉ COPPER MINES
UNDERGROUND C-ZONE AP-264-S

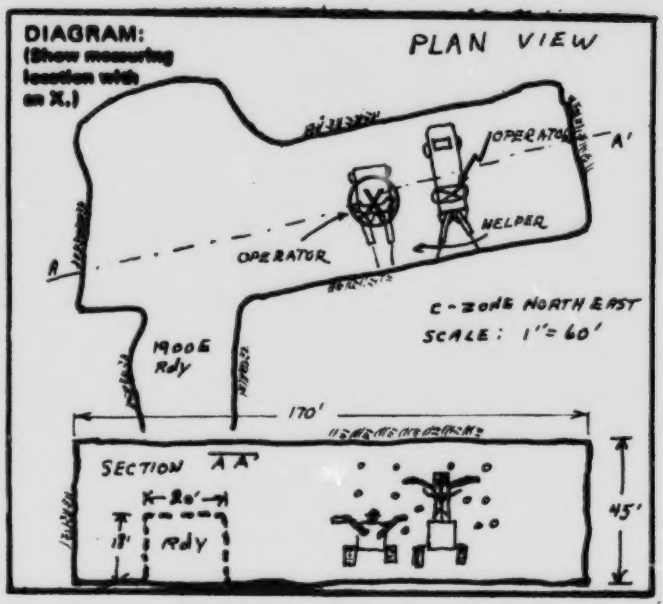
NUMBER OF PERSONNEL EXPOSED: 3

WEARING EAR PROTECTION? ☑ yes ☐ no

OPERATOR: M. SAVICH, C. FONTAINE

Equipment JUMBO #311 (SEE NOTES).
Manufacture GASPÉ COPPER MINES.
Steel type HEXAGONE Ø
Length (m.) 16 ft. (14 ft. HOLES).
Bit type GROSS BIT Ø
Muffler type NO MUFFLER
Air kPa 85 Lbs/IN²
Water kPa 65 Lbs/IN²
Airflow m³/min.
Blow rate (blow/min) 1100
Penetration m./min. 7.8-8.8 IN./MIN.
Rock type SKARN

DIAGRAM: (Show measuring location with an X.)



NOTES: THERE WERE 2 JUMBOS IN THE STOPE: JU-M-311 (LOW JUMBO) AND JU-M-310 (HIGH JUMBO)

	dBA MAX LEVEL	EXPOSURE TIME If necessary, note time of day	TOTAL DURATION IN HOURS PER DAY	PERMISSIBLE HOURS PER DAY	C/T
			C	T	
MAXIMUM LEVELS AS MEASURED ON THE "A" SCALE OF THE SOUND-LEVEL METER. IF THE READING IS BETWEEN LEVELS SPECIFIED, USE THE HIGHER LEVEL.	OVER 115			NONE	
	115	.755 + 1.138 + .481 + .030	2.404	¼	9.62
	110	.073 + .056 + .150 + .444 + .580	1.303	½	2.61
	105	.002 + .032 + .0675	.102	1	0.102
	102	.012 + .007	.019	1½	0.013
	100	.011	.011	2	0.006
	97	.038	.038	3	0.013
	95	.0175 + .327 + .009	.354	4	0.088
	92	—		6	
	90	.096	.096	8	0.012
	UNDER 90			ANY	0

IMPACT CHECK: EXPOSURE OF UNDER 100 dB PEAK SOUND-PRESSURE LEVEL AS MEASURED WITH AN IMPACT NOISE ANALYZER, OR OF UNDER 120 dB AS MEASURED WITH A SOUND-LEVEL METER ON C WEIGHTING, FAST RESPONSE, 140 dB FULL SCALE RANGE.

MAX- dB(C)

TOTAL 12.463
To comply with regulations, total cannot be more than 1.

RECOMMENDATIONS:

SIGNED: [signature]

ELLIOT LAKE LABORATORY, MINES BRANCH, E.M.R.

Plant-Noise Survey Form

DATE: AUGUST 23/74
METER #: B+K 2205

LOCATION: GASPÉ COPPER MINES
UNDERGROUND 29 STOPE - ROADWAY

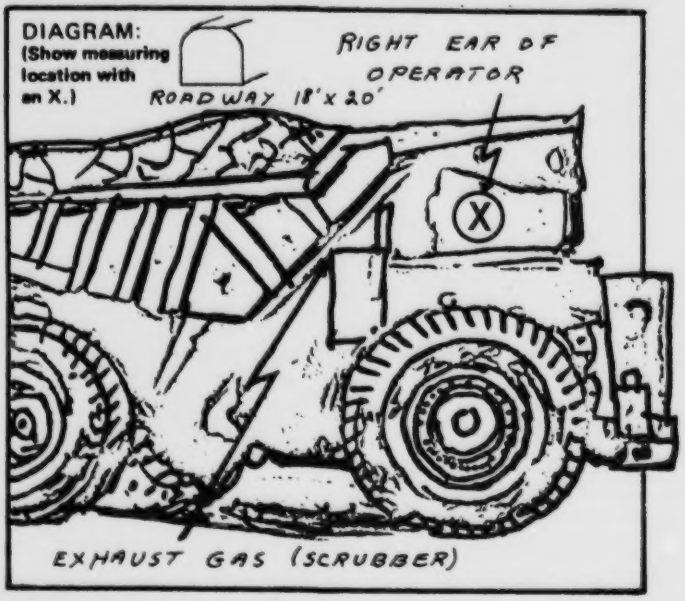
NUMBER OF PERSONNEL EXPOSED: 1

WEARING EAR PROTECTION? ☐ yes ☑ no

OPERATOR: C. FONTAINE

Equipment TK-LW-685 35 TON TRUCK
Manufacture AUTOMOTIVE PRODUCT
Steel type
Length (m.)
Bit type
Muffler type WATER BATH SCRUBBER
Air kPa
Water kPa
Airflow m³/min.
Blow rate (blow/min.)
Penetration m./min.
Rock type SKARN

DIAGRAM: (Show measuring location with an X.)



NOTES: THE TRUCK STOPPED OPERATION AT 10:30 A.M. BECAUSE ORE PASS WAS FULL

	dBA MAX LEVEL	EXPOSURE TIME If necessary, note time of day	TOTAL DURATION IN HOURS PER DAY	C PERMISSIBLE HOURS PER DAY T	C/T
MAXIMUM LEVELS AS MEASURED ON THE "As" SCALE OF THE SOUND-LEVEL METER. IF THE READING IS BETWEEN LEVELS SPECIFIED, USE THE HIGHER LEVEL.	OVER 115			NONE	
	115			¼	
	110	.03 + .003	.033	½	.066
	105	.008 + .009	.017	1	.017
	102	.034 + .011	.045	1½	.030
	100	.124 + .075 + .148	.347	2	.173
	97	.014 + .049	.063	3	.021
	95	.009 + .019 + .027	.055	4	.014
	92	.007 + .002	.009	6	.002
	90	.595	.595	8	.074
	UNDER 90	1.768	1.768	ANY	0

IMPACT CHECK (MUST BE UNDER 140 dB PEAK SOUND-PRESSURE LEVEL AS MEASURED WITH AN IMPACT NOISE ANALYZER, OR BE UNDER 120 dB AS MEASURED WITH A SOUND-LEVEL METER ON C WEIGHTING, FAST RESPONSE, 140 dB FULL SCALE RANGE.

MAX- dB(C)

TOTAL .397

To comply with regulations, total cannot be more than 1.

RECOMMENDATIONS:

SIGNED: [signature]

ELLIOT LAKE LABORATORY, MINES BRANCH, E.M.R.

Plant-Noise Survey Form

DATE: AUGUST 27/74
METER #: 2205

LOCATION: GASPÉ COPPER MINES SMELTER

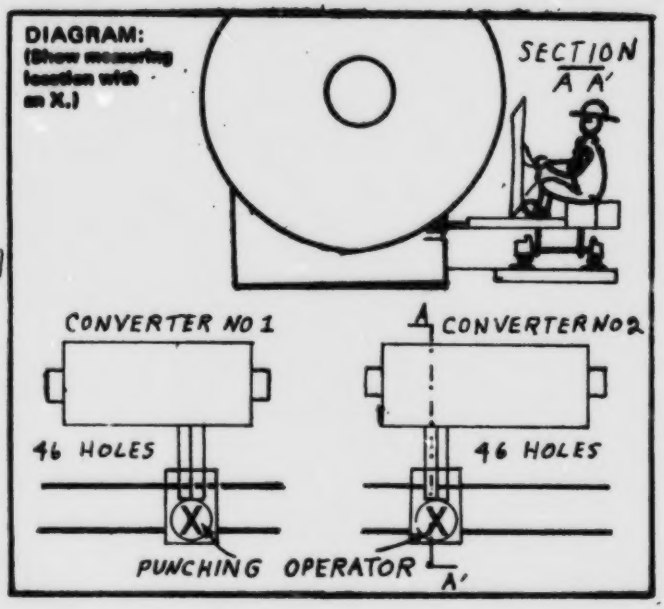
NUMBER OF PERSONNEL EXPOSED: 1

WEARING EAR PROTECTION? ☑ yes ☐ no

OPERATOR: M. SAVICH, S. GHONEIM

Equipment CONVERTER (PUNCHING MACHINE)
Manufacture
Steel type
Length (cm) 5 ft.
Bit type
Muffler type
Air kPa 85 lbs/in²
Water kPa
Airflow m³/min.
Blow rate (blow/min)
Penetration m/min.
Rock type

DIAGRAM: (Show measuring location with an X.)



NOTES:

	dBA MAX LEVEL	EXPOSURE TIME If necessary, note time of day	C TOTAL DURATION IN HOURS PER DAY	T PERMISSIBLE HOURS PER DAY	C/T
MAXIMUM LEVELS AS MEASURED ON THE "A" SCALE OF THE SOUND-LEVEL METER. IF THE READING IS BETWEEN LEVELS SPECIFIED, USE THE HIGHER LEVEL.	OVER 115			NONE	
	115	0.389	0.389	¼	1.56
	110	—	—	½	—
	105	0.479	0.479	1	0.48
	102	—	—	1½	—
	100	0.358	0.358	2	0.18
	97	0.471 + 0.3	0.771	3	0.26
	95	1.979 + 0.096	2.075	4	0.52
	92	0.285	0.285	6	0.05
	90	1.818	1.818	8	0.23
	UNDER 90			ANY	0

IMPACT NOISE: IMPACT OR IMPULSE NOISE IS THAT WHICH CONSISTS OF SUDDEN, STRONG OUTBURSTS OF SOUND ENERGY OF SHORT DURATION, GENERALLY LESS THAN ONE SECOND, AS OBSERVED WITH A SOUND-LEVEL METER SET FOR SLOW RESPONSE. IF IMPACT NOISE IS PRESENT, IT SHOULD BE MEASURED WITH THE METER SET FOR FAST RESPONSE.

MAX- dB(C)

TOTAL 3.28
To comply with regulations, total cannot be more than 1.

RECOMMENDATIONS:

SIGNED: A. Thy Gault

76-79 M. Savich

Noise measurement of trucks in

Brunswick mining and smelting

No. 6 site - open pit

1976

MESURES DU BRUIT DES CAMIONS AU SITE N°6, MINE À CIEL OUVERT, DE LA BRUNSWICK MINING AND SMELTING

M. Savich*

RÉSUMÉ

On a effectué un court relevé de bruit au site n° 6, mine à ciel ouvert, de la Brunswick Mining and Smelting. On a mesuré le bruit des camions, l'exposition des opérateurs et l'atténuation produite par un silencieux maison installé sur un camion TEREX 45. Un certain nombre de suggestions visant à réduire le bruit sont présentées :

1) Les cabines du TEREX 45 et du TEREX 50 devraient être modifiées de façon à offrir une plus grande atténuation.
2) On pourrait réaliser des atténuations plus élevées à l'aide d'un silencieux maison, si on le voulait, en utilisant des modèles de rechange.
3) Les indices d'exposition au bruit des opérateurs de camions de roulage ont été prévus à partir de temps d'échantillonnage courts.

L'atténuation du silencieux maison, mesurée au niveau de l'oreille de l'opérateur dans la cabine, s'élevait à :

- 4,2 dBA, fenêtre ouverte, et
- 3,8 dBA, fenêtre fermée.

L'atténuation du silencieux maison installé sur un camion TEREX 45 est assez élevée pour que l'indice d'exposition sur une période de 8 heures soit inférieur à 0,5, et il permet au conducteur de travailler sans porter de protecteur d'oreilles.

Le niveau de bruit indiqué sur la bande de papier de l'enregistreur de niveau graphique peut servir à des fins d'étude par chronométrage, étant donné qu'il représente les différentes phases de travail avec une précision extraordinaire. Les résultats obtenus peuvent être appliqués à une longue période. L'indice d'exposition au bruit peut être mesuré à l'aide d'une montre seulement étant donné que le niveau de bruit continu équivalent est constant.

Bruit; mesure; instrument; mine à ciel ouvert; camion; silencieux; étude par chronométrage.

*Chercheur scientifique, Laboratoire d'Elliot Lake, Laboratoires de recherche minière, Énergie, Mines et Ressources Canada, Elliot Lake (Ontario).

NOISE MEASUREMENTS OF TRUCKS IN BRUNSWICK MINING AND SMELTING NO. 6 SITE - OPEN PIT -

by

M. Savich*

ABSTRACT

A short noise survey has been made at Brunswick Mining and Smelting, No. 6 Site, open pit. Measurements of truck noise, operator exposure and the attenuation of a home-made muffler on a TEREX 45 truck have been made. A number of suggestions are made to control noise:

(1) TEREX 45 and TEREX 50 cabs should be redesigned to improve attenuation.
(2) Higher attenuations by home-made muffler could be achieved if desired using alternate designs.
(3) Noise Exposure Indices of haulage truck operators were predicted using short sampling times.

The attenuation of the home-made muffler, measured at the operator's ear in the cab, amounted to:

- with the window open - 4.2 dBA, and
- with the window closed - 3.8 dBA.

The attenuation of the muffler on a TEREX 45 truck is good enough that the exposure index for 8 hours is smaller than 0.5 and it allows the driver to work without hearing protectors.

The noise level as indicated on the paper tape of the Graphical Level Recorder can be used for time study purposes, since it shows the different phases of work with extraordinary accuracy. The results obtained can be used for a long time period. The Noise Exposure Index can be measured with only a wristwatch since the Equivalent Continuous Noise Level is constant.

Noise: Measurement: Instrument: Open Pit: Truc k: Muffler: Time Study

*Research Scientist, Elliot Lake Laboratory, Mining Research Laboratories, Department of Energy, Mines and Resources, Elliot Lake, Ontario.

FOREWORD

As part of the noise abatement program being conducted by the Noranda Research Centre, comprehensive noise surveys were planned in select Noranda Mines. Discussions with CANMET indicated a common interest in assessing noise in Canadian metal mines, so a joint program was established.

Objectives. To measure the noise attenuation offered by an exhaust muffler for TEREX 45 haulage trucks designed by Brunswick personnel, and to compare overall noise levels in the cabs of TEREX and WABCO haulage trucks.

Scope. Muffler performance was evaluated by measuring the sound pressure level at the operator's ear using a sound level meter and dosimeters on two TEREX 45 trucks, one with a muffler one without. Sound pressure levels in one each of TEREX 45 and TEREX 50 and WABCO 85 cabs were measured in front, back and on both sides of each vehicle to determine what attenuation was offered by each cab.

CONTENTS

	Page
Abstract	i
Foreword	ii
1. Introduction	1
1.1 Hearing Loss from Noise Exposure	1
1.2 Hearing Loss Criteria	2
1.3 Regulations and Code	4
2. Field Measurements: Equipment and Technique	6
2.1 Instruments	6
2.1.1 Sound Level Meter	6
2.1.2 Noise Exposure Monitor or Dosimeter	7
2.1.3 Statistical Analysis	8
2.2 Technique for Analysis of Results	8
3. Noise Measurements of Trucks	8
3.1 Haulage Noise in Open Pit Mines	9
3.2 Attenuation of Noise in Home-Made Muffler	12
3.3 Influence of Muffler on Noise Exposure Index	14
3.4 Time Study	18
4. Conclusion	21
5. Recommendations	22
6. References	23
7. Acknowledgements	24

APPENDICES

1. Plant-Noise Survey Form, Standard Method: Cab of Truck TEREX 45.

2. Noise Survey Form, Graphical Method: Cab of Truck TEREX 45.

3. Noise Survey Form, B & K 166 Environmental Noise Classifier: Cab of Truck TEREX 45.

FIGURES

Page

1. Mean Audiogram of Employees Exposed to Industrial Noise (1) ---- 2
2. Comparison of the Noise Spectra between Open Window and Closed Window in the TEREX 45 Cab ---------- 11
3. Truck Sound Level Ranges for One Complete Haulage Cycle ------- 13
4. Haulage Cycles on Paper Tape of Portable Graphic Level Recorder, B & K, Type 2306 ---------- 20

TABLES

1. OSHA Noise Standard - Permissible Noise Exposure ---------- 5
2. Noise from Open Pit Haulage Trucks ---------- 10
3. Noise Reduction by Muffler in Truck TEREX 45 (see Figure 3) ---- 15
4. Noise Exposure Index, Truck TEREX 45 without Muffler (Measurement by M. Fraser) ---------- 16
5. Noise Exposure Index, Truck TEREX 45 without Muffler (Measurement by M. Savich) ---------- 17
6. Noise Exposure Index, Truck TEREX 45 with Muffler ---------- 19

1. INTRODUCTION

In industrial society, noise pollution is becoming more of a problem as noise levels increase. Hearing loss may result from exposure to a noisy work environment. Noise measurement in mines is directed toward the following objectives:

- estimation of the noise to which mine workers are exposed;
- control of noise sources "in situ";
- audiometric examination of mine workers subjected to prolonged exposure to high noise levels.

Criteria may be established for several purposes: operator hearing protection, community hearing protection, community noise annoyance and speech interference, to name a few. In this report the prime purpose is to establish the types of noise environments to which an operator of mines or heavy equipment might conceivably be exposed.

1.1 Hearing Loss from Noise Exposure

Occupational deafness is irreversible hearing loss (the permanent threshold shift - PTS). Hearing loss for a given sound is the difference in decibels between the hearing threshold for that sound and the threshold of hearing. Audiometric testing of miners who have been subjected to prolonged exposure to high noise levels will reveal enfeeblement of hearing acuity in the higher frequency ranges between 3000 and 6000 Hz (1).

A noise-induced hearing loss initially damages the sensitive hair cells in the organ of the Corti, causing a loss of acuity at 4000 Hz, and abbreviated as the C^5 dip (C^5 on the musical scale has a frequency of 4096 Hz). If a person's ability to hear conversational speech has not been affected, the hearing loss goes undetected in its temporary stage (the temporary threshold shift - TTS). These two types of hearing loss have many gradations

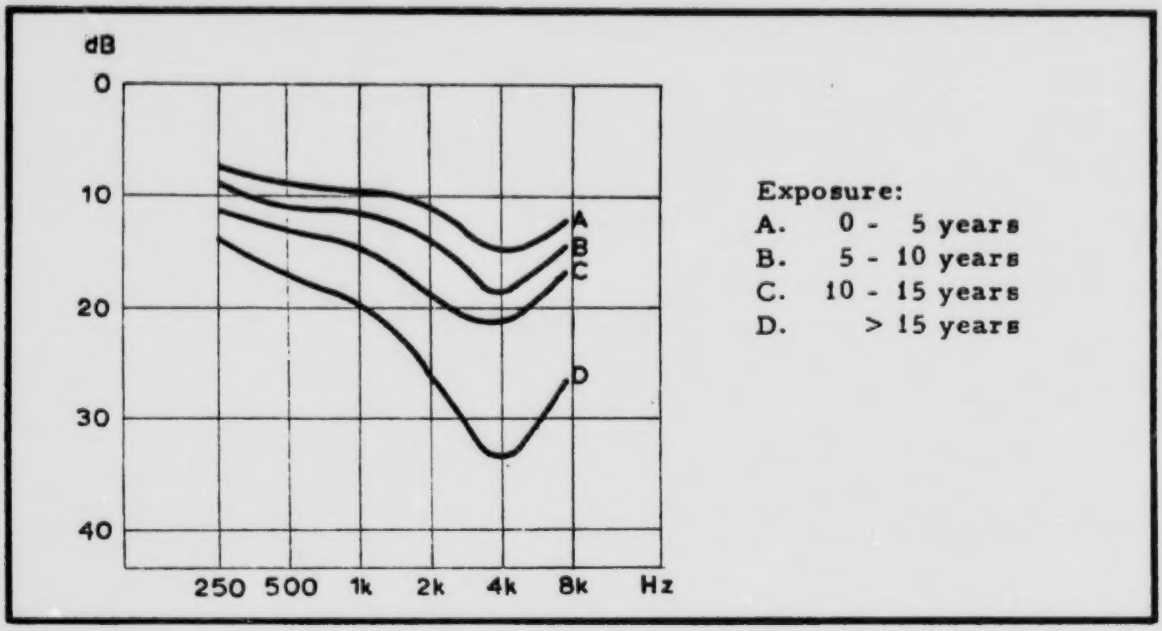


FIGURE 1: Mean Audiogram of Employees Exposed to Industrial Noise (1).

between them. In evaluating noise-induced hearing loss, the PTS should be measured after recovery of TTS, and PTS should be measured after termination of exposure, or before work commences.

A noise-induced hearing loss generally affects both ears in persons under 40 years of age. Some individuals seem more sensitive to loud sound than others (2). When examining the hearing of a mining or industrial community, the various non-occupational causes of hearing loss, in particular infection, during intoxication and presbycosis, should be kept in mind.

1.2 Hearing Loss Criteria

Mining (industrial) noises are a complex mixture of several notes having their individual frequencies, intensities, and distribution in time. The different types of noise are:

a) continual wide-band noise, i.e. noise including a wide range of

frequencies, e.g. general mining or machine shop noise;

b) continual narrow-band noise, i.e. the sound energy is concentrated in a few frequencies, e.g. drill hammers and circular saws;

c) impact or impulse noise, i.e. short duration impulses, e.g. tapping and hammering (the noise is a change in sound pressure level of 40 dB or more within 0.5 seconds);

d) steady-state (continuous) repeated impact noise where a change in sound pressure level is less than 40 dB between successive 0.5 sec intervals, e.g. rivetting and breaking;

e) intermittent noise where there are several periods of steady-state noise with intervals of ambient noise, e.g. traffic and drilling noise.

Using time and level as the measure, there are four classes into which occupational noise exposures may be grouped:

1. long-term continuous noise,
2. short-term continuous noise,
3. intermittent equal-intensity noise, and
4. intermittent variable-intensity noise.

Long-term continuous noise is defined as noise of a constant level and spectrum to which a listener is exposed for 6 to 8 hours per day, 40 hours per week, 50 weeks per year. Most criteria are written for this type of operator exposure noise.

Short-term continuous noise is defined as broad-band noise at a constant level for less than 5 hours per day, 5 days per week, for life. The octave bands 500, 1000, and 2000 Hz are considered, because these bands are of importance in the protection of hearing for speech.

Intermittent equal noise exposure is defined as exposure time to a given broad-band pressure-level times per day during a normal working day.

Intermittent variable noise is defined as broad-band noise which is intermittent in time duration and variable in both duration of "on" and "off" time and absolute magnitude. Two basic methods are currently available. The equal-energy theory (3) reasons that hearing-damage risk is determined by the total amount of energy for each day (8 hr). For half-day exposure (4 hr), 3 dB greater noise levels are permissible for the same risk. Each halving of energy permits adding 3 dB to the noise levels permissible. The equal temporary effect theory (the temporary threshold shift - TTS) (3) is based on the observation that those noise exposures which ultimately produce permanent hearing loss also produce temporary hearing loss in young ears. Sataloff, Vassallo, and Mendulse (3) found that underground iron ore miners exposed intermittently to intense rock drill noise showed no greater hearing damage to noise exposure than do mill workers exposed to steady noise 20 dB lower. Other reports of hearing damage to miners agree with Sataloff et al. (3, 4). Intermittent variable noise is the most common noise in a mining and metallurgical environment.

1.3 Regulations and Code

The noise exposure may be specified as being the constant sound level for its duration. If the sound level varies with time, the mean level must be obtained by calculation. The permissible noise levels refer to sound pressure levels that represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech (Table 1).

The sound level shall be determined by a sound level meter, meeting the standards of the United States of America Standards Institute and operating on the A-weighting Network with slow meter response. The A-weighting scale is used to measure hazardous noise because it discriminates against the low frequencies and more closely simulates the response of the human ear than other weighted scales.

The new proposed standard still limits an employee's exposure to 90 dBA, as an eight hour time-weighted average (Federal Register,

TABLE 1

OSHA[+] Noise Standard - Permissible Noise Exposure

Duration per Day Hours	Sound Level dBA*
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115**

* Sound Level Meter on the slow-response setting.
**Ceiling value.

Vol. 39, No. 207, October 24, 1974). However, it requires identification of all sources generating noise levels in excess of 85 dBA and audiometric testing of all employees exposed to 85 dBA and greater for 8 hours a day.

OSHA will continue to limit exposure to impulse noise to 140 dB peak sound pressure level. The proposed standard will make use of a exponential scale for noise levels and frequency of impulses. The number of impulses allowed at 140 dB would be 100 per day. For 130 dB, the number of allowable impulses would be 1000 per day. For each 10 dB decrease in impulse noise level, the number of impulses to which employees are exposed may be increased by a factor of 10.

The OSHA Standard has established the following priorities for compliance:

1. Feasible engineering controls such as reducing the noise at the source, along the path, or in the employee's hearing zone.

[+] Occupational Safety and Health Administration (U.S.A.).

2. Feasible administrative measures by limiting the exposure of the employee to noise through job rotation and production scheduling.

3. Hearing protectors used as a temporary means of limiting noise exposure until engineering controls and administrative measures are implemented.

Where the engineering and administrative controls which have been implemented do not reduce the sound levels to within the permissible limits, the employer shall continue to develop and implement engineering and administrative controls as they become feasible (OSHA).

It was agreed to use OSHA criteria since New Brunswick regulations were being revised at the time the survey was conducted.

2. FIELD MEASUREMENTS: EQUIPMENT AND TECHNIQUE

The measurement of noise levels should be associated with a noise control problem in a mine or mill. The conditions demanding this data should be established before the measurement project starts. From this information, suitable field and laboratory equipment can be selected. Measurements such as these can be made at little cost and effort, simply by introducing noise exposure as a factor in mining and mill production planning.

2.1 Instruments

Instruments are required to determine the noise levels to which underground employees are exposed, to evaluate noise survey techniques and equipment, and to compare noise exposure using a sound level meter and noise exposure dosimeter.

2.1.1 Sound Level Meter

The basic system for measuring sound pressure levels or vibration acceleration levels with a sound level meter consists of the following:

1. Transducer (the Piezoelectric Microphone type 4117, B and K, and the Condenser Microphone type 4145, B and K) and calibrator (Pistonphone type 4220 B and K, or Sound Level Calibrator type 4230, B and K).

2. Preamplifier type 2619, B and K (IEC R 327 and ANSI S1.70-1966):

3. Sound Level Meter (IEC R 123 and ANSI S1.4-1971):

   a) Sound Level Meter type 2205, B and K, has built-in A, B, and C-weighting networks, "Fast" and "Slow" meter damping; and

   b) Impulse Precision Sound Level Meter type 2209, B and K, has a frequency range 2 Hz to 70 kHz; A, B, C, and D Linear frequency response, octave filter type 1613, B and K, and impulse measurement with max. RMS hold, etc. (IEC R 179); and

4. Level Recorder type 2306, B and K, records DC signal and RMS average or peak value of AC signals as function of time or frequency, from 2 Hz to 200 kHz.

2.1.2 Noise Exposure Monitor or Dosimeter

A sound level survey alone is not enough because most industrial noise levels vary. Critical areas should be continuously monitored during the work day to determine if the duration of high noise levels is longer than that permitted by the OSHA Noise Standard. A special instrument, the noise dosimeter, has been developed. In this case the noise does may be defined as the constant sound level for the time duration (Equivalent Continuous Sound Level-L_{eq}). The instrument can be divided into two categories:

a) In type A, the voltage is converted to a current and used to plate the electrodes of an electro-chemical memory cell. The amount of plating of the cell is then read out as a percentage of exposure.

b) In type B, the signal from the integrator circuit is converted to pulses that are stored and later read out as a percentage of exposure.

The manufacturers of both types of instruments claim compliance with ANSI S 1.4-1971 for type 2 sound level meter.

These instruments are available either in stationary format, or in portable versions so they can be carried in the pocket of a worker preferably with the microphone mounted close to his ear.

2.1.3 Statistical Analysis

The Noise Classifier classifies noise levels into amplitude bands. The instrument has application where irregular noise patterns require analysis.

2.2 Technique for Analysis of Results

The sound level meter and impulse precision sound level meter were used to observe the sound levels. Both instruments were operated on the A-weighted network, slow response, and calibrated with the calibrator before and after each shift.

Construction of the universal attachment permitted technical development for measuring noise level criteria. Sound level measurements were usually taken within one meter of the miner's ear. The total duration of exposure in hours was determined by full-shift time studies and partial-shift time studies. The impulse precision sound level meter was connected with a portable level recorder. The level recorder gave a graphical display of the sound level as a function of time. For frequency analysis an external filter was connected on the impulse precision sound level meter. Records of such surveys show the instruments used, data and location of the test, machinery or equipment generating the noise, and the names of the operators.

The Noise Exposure Dosimeter was fastened on the miner with the microphone as close to the ear as possible.

3. NOISE MEASUREMENTS OF TRUCKS

The overall noise level of a truck consists of many noise sources which differ in intensity and frequency content (5):

1. Basic engine noise consists of: mechanical noise, noise generated by combustion forces and indirect noise coming from mounted accessories.

2. Other engine operating noises are usually isolated from basic engine: intake and exhaust noise and fan noise.

3. Drive train noise consists of noise from the transmission system such as gears, bearings, clutches, etc.

4. Chassis and body component noise includes the suspension and braking system, air compressors, horns, aerodynamic noise and impact of body components.

5. Tire noise.

The engine exhaust noise is the major source of noise in a basic engine as well as in the vehicle itself.

The engine exhaust noise radiates from the engine exhaust pipe by the pressure pulsations due to the sudden opening of exhaust valves and the turbulent motion of exhaust gas in the pipe.

Control of exhaust noise by the use of exhaust mufflers would be relatively simple if the muffler design was not limited by space and weight. The spectra of intake and exhaust noise are characterized by their low frequency range.

3.1 Haulage Noise in Open Pit Mines

The analysis of the trucks was performed near the pit garage and the truck parking lot. For haulage mostly 45, 50 and 85 ton trucks are used.

Table 2 shows a stationary test which is becoming very useful in open pit mines for enforcement. A stationary test is good enough for the observation of noise levels from exhaust systems. At the standard distance of 50 feet from the truck the data show highest noise levels at the right side with all trucks performing equally well. At engine W.O.T. the WABCO 85 produced less noise than the TEREX 45 and TEREX 50. At engine "Idle", the WABCO 85 made more noise at the front and at the right side, and almost the same noise at the rear and at the left side as did the TEREX 45

TABLE 2

Noise from Open Pit Haulage Trucks

Position		TEREX 45				TEREX 50				WABCO 85	
		VHO 34		VHO 39		VHO 51		VHO 54		VHO 82	
		Idle	WOT*	Idle	WOT	Idle	WOT	Idle	WOT	Idle	WOT
Distance 50 ft	Front	72	86	75	90	74	94	73	93	76	87
	Right Side	74	91	75	93	76	96	74	96	79	90
	Rear	69	79	74	88	76	94	71	92	74	88
	Left Side	74	89	75	91	75	96	70	93	74	87
In Cab	Open Window	--	--	78	101	78	103	76	99	--	--
	Closed Window	--	--	78	101	78	103	76	99	69	84

*WOT - Wide Open Throttle.

and the TEREX 50. The noisiest truck was the TEREX 50.

Measurements in the cab at the driver's seat indicate that the WABCO 85 was the quietest vehicle and the TEREX 50 the noisiest, although not significantly different than the TEREX 45.

Other than that, the test showed that the cab in the TEREX 45 and the TEREX 50 did not have acoustic isolation, because the results were the same whether or not the windows were open (Table 2).

Comparison of the Noise Spectra in the TEREX 45 cab confirmed that there were no significant differences between the open window and the closed window (Figure 2).

Eight years ago a discussion of the noise problem in the truck cabs would have received little attention. Unfortunately, the TEREX 45 and the TEREX 50 belong to this era. Many aspects will need consideration if

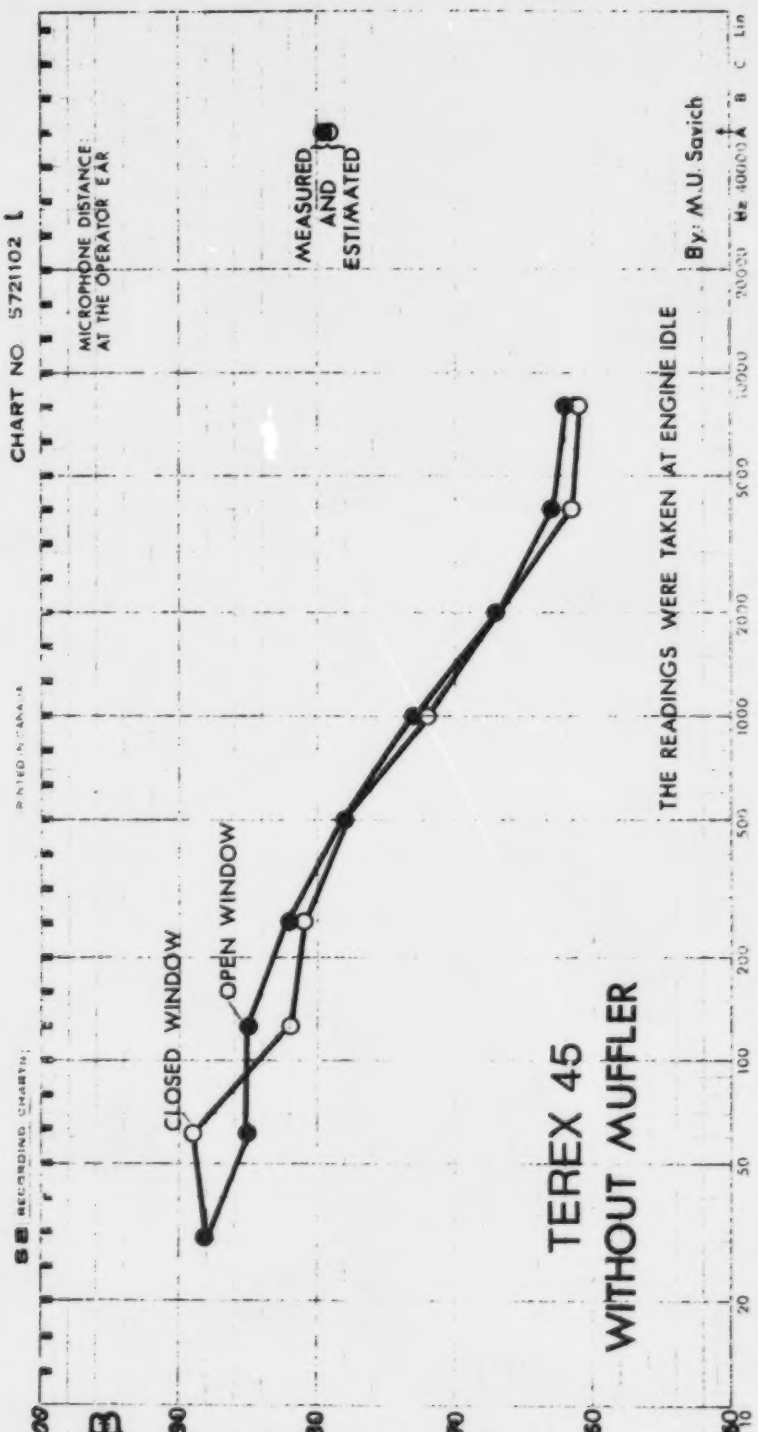


FIGURE 2: Comparison of the Noise Spectra between Open Window and Closed Window in the TEREX 45 Cab.

if cabs are to be redesigned.

Some of these aspects are (6):

1. Structural design.
2. Sealing.
3. Cab absorption.
4. Cab transmission loss.

Significantly, a quieter WABCO 85 cab was developed, down to 85 dBA, because the noise control was considered from the very beginning of a cab design program (Table 2). The object of the new designs was to use systems that do not require slits or openings to operate.

3.2 Attenuation of Noise in Home-Made Muffler

In order to increase and provide a wide range of attenuation, the Brunswick Mines shop made a reactive muffler and it was mounted in a TEREX 45 truck. There is no real or technical distiction between a muffler and a silencer. These devices can be divided into two basic groups: reactive and absorptive. Reactive mufflers depend on the reflection or expansion of the sound waves with corresponding self-destruction as the basic noise reduction mechanism. Absorptive mufflers contain fibrous or porous materials and depend on their absorptive properties to reduce noise.

Measurements were performed in the cab at the driver's seat. The truck's Sound Level Range was observed for one complete haulage cycle from W. Waste Pile to the bin at a distance of 3, 600 feet (1, 115 m) and back (Figure 3). The noise level in the dB A-Network was recorded on the level recorder, B & K, type 2306. The paper speed was 0. 3 mm/s, and a sapphire stylus on wax-coated paper was used for accurate results. The values from the recording paper were sorted from 85 dBA up.

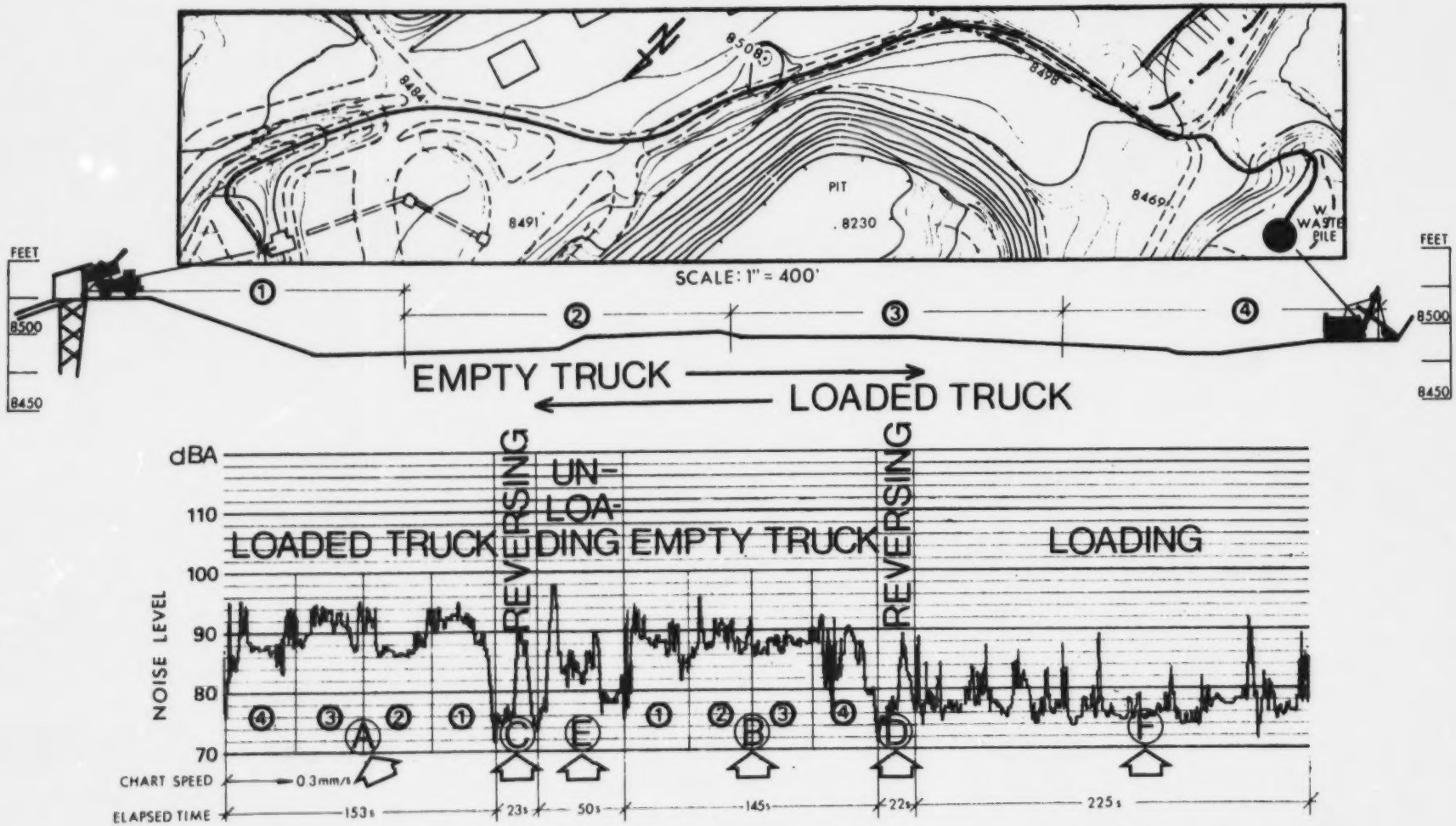


FIGURE 3: Truck Sound Level Ranges for One Complete Haulage Cycle.

From Figure 3 it can be seen that noise levels depend on the configuration:

Loaded truck	Empty truck
←	→
④ ③ ② ①	① ② ③ ④
Av. velocity = 16.4 miles/hr (26.2 km/hr)	Av. velocity = 17.3 miles/hr (27.7 km/hr)

A loaded truck has a higher noise level than an empty truck.

The results of the measurements are shown according to phases of the haulage cycle (Table 3). Attenuation variations in the phases of the haulage cycle are shown in Figure 3 (A, B, C, D and E). During phase F there is no attenuation because the noise is caused by the impact of loading. Because of the impact the noise result is not realistic. In this case the cab acts like a reverberent room. The calculated mean value of attenuation of the muffler, in the TEREX 45 (loaded and empty) (A, B) and two reverse situations (C, D) are as follows:

- window open - 4.2 dBA, and
- window closed - 3.8 dBA.

It is possible that improvements in the construction of home-made mufflers can be made to provide greater attenuation.

3.3 Influence of Muffler on Noise Exposure Index

The duration of the measurements was carefully chosen to include exactly one complete cycle or whole numbers of truck cycles. The short sample of the noise emitted by the truck will then be representative and can be extrapolated to longer times because the truck operating cycle is always the same.

Independent measurements of the Noise Exposure Index (E.I.) were done by M. Fraser (with three different instruments) and M. Savich (with two instruments) on the TEREX 45 without the muffler (Tables 4 and 5). Each investigator measured four haulage cycles and the results were nearly

TABLE 3

Noise Reduction by Muffler in TEREX 45 Truck
(See Figure 3)

	TEREX (45 TON)	Window(W) Open(O) Closed(C)	1st Haulage Cycle dBA Max	Min	Mean	Std Dev	No. Samp	2nd Haulage Cycle dBA Max	Min	Mean	Std Dev	No. Samp	3rd Haulage Cycle dBA Max	Min	Mean	Std Dev	No. Samp	Σ Haulage Cycle dBA Max	Min	Mean	Std Dev	No. Samp	Note
A	Loaded truck without muffler	W/O	100	87	95	0.2	151	101	85	94.4	0.2	152	-	-	-	-	-	101	85	94.7	0.2	303	
		W/C	97	85	92.5	0.2	133	99	85	92.5	2.7	204	-	-	-	-	-	99	85	92.5	0.1	337	
	Loaded truck with muffler	W/O	96	85	90.9	0.2	95	95	85	90.1	0.2	137	95	85	89.6	0.2	142	96	85	90	0.1	374	Attenuation 4.7 dBA
		W/C	93	85	88.1	1.9	134	96	85	88.2	0.2	117	93	85	89.0	1.8	111	96	85	88.4	0.1	362	Attenuation 4.1 dBA
B	Empty truck without muffler	W/O	100	85	92.8	0.2	145	100	85	92.4	0.3	149	-	-	-	-	-	100	85	92.6	0.2	294	
		W/C	98	85	91.6	0.2	154	99	85	91.2	0.3	91	-	-	-	-	-	99	85	91.4	0.2	245	
	Empty truck with muffler	W/O	95	85	88.6	0.2	156	95	85	88.7	0.2	131	94	85	88.8	0.2	118	95	85	88.7	0	405	Attenuation 3.9 dBA
		W/C	93	85	87.4	0.2	94	91	85	87.7	0.2	78	93	85	88.1	0.2	113	93	85	87.8	0.1	285	Attenuation 3.6 dBA
C	Loaded truck without muffler Reverse-Unloading	W/O	98	85	91	0.6	27	93	86	89.9	0.8	9	-	-	-	-	-	98	85	90.7	0.5	36	
		W/C	94	86	89.5	0.7	13	94	87	91.5	0.6	13	-	-	-	-	-	94	86	90.5	0.5	26	
	Loaded truck with muffler Reverse-Unloading	W/O	91	86	88.5	0.6	11	90	85	87.3	0.5	11	91	86	88.4	0.6	10	91	85	88	0.3	32	Attenuation 2.7 dBA
		W/C	90	85	86.7	1.2	3	88	85	87	0.4	7	90	86	87.3	0.6	6	90	85	87.1	0.3	16	Attenuation 3.4 dBA
D	Empty truck without muffler Reverse-Loading	W/O	97	85	89.7	0.6	32	101	85	92.4	0.7	36	-	-	-	-	-	101	85	91.1	0.5	68	
		W/C	98	85	89.8	0.5	52	97	85	91.1	0.6	30	-	-	-	-	-	98	85	90.3	0.4	82	
	Empty truck with muffler Reverse-Loading	W/O	89	85	87	0.8	4	89	85	87.2	0.7	5	0	0	0	0	0	89	85	86.6	0	9	Attenuation 4.5 dBA
		W/C	89	85	87	0.6	7	94	85	87.7	1	8	92	85	87.7	1	6	94	85	87.5	0.5	21	Attenuation 2.8 dBA
E	Loaded truck without muffler Unloading	W/O	97	85	91.1	0.8	30	107	85	91.9	1.2	39	-	-	-	-	-	107	85	91.6	0.7	69	
		W/C	108	87	97.5	1.1	33	106	86	96.1	1	27	-	-	-	-	-	108	86	96.9	0.8	60	
	Loaded truck with muffler Unloading	W/O	94	85	88.4	0.4	46	98	86	89.8	0.9	21	97	86	90.9	0.9	18	98	85	89.3	0.1	85	Attenuation 2.3 dBA
		W/C	96	87	91.9	1	8	96	85	88.7	0.8	15	98	86	91.2	1	13	98	85	90.3	0.6	36	Attenuation 6.6 dBA
F	Empty truck without muffler Loading	W/O	92	85	88.1	0.6	16	94	85	87.8	0.7	15	-	-	-	-	-	94	85	88	0.5	31	
		W/C	9	85	87.7	1.8	3	89	85	86.3	0.5	10	-	-	-	-	-	91	85	86.6	0.5	13	
	Empty truck with muffler Loading	W/O	95	86	89.7	0.9	9	91	86	87.8	0.5	10	96	85	88.4	1.1	11	96	85	88.6	0.1	30	No attenuation(-0.6 dBA)
		W/C	91	86	88.7	1.5	3	87	87	87	0	2	90	85	87.2	0.9	6	91	85	87.5	0.6	11	No attenuation(-0.9 dBA)

TABLE 4

TEREX 45 Truck without Muffler
(Measurement by M. Fraser)

Haulage Cycle	Inside Cab, at Operator's Right Ear						Outside cab at mirror
	Sound Level Meter B&K, Type 2205		Noise Classifier B&K, Type 166		Noise Dose Meter B&K, Type 4425		Noise Dose Meter B&K, Type 4425
	E.I. *	Leq(dBA)**	E.I.	Leq(dBA)	E.I.	Leq(dBA)	E.I.
1	0.0227+	95	0.028	96.5	0.025	95.5	0.1567
2	0.0205	94.7	0.026	96	0.0246	95.2	0.1494
3	0.0235	95.8	0.034	97.2	0.0283	95.5	0.1615
4	0.0233	95.5	0.028++	95.8	0.027	95.2	0.1512
Average	0.0225	95.3	0.029	96.4	0.026	95.4	0.1547

* Exposure Index.
** Equivalent Continuous Sound Level.
\+ See Evaluation in Appendix 1.
++ See Evaluation in Appendix 3.

TABLE 5

Noise Exposure Index
TEREX 45 Truck without Muffler
(Measurement by M. Savich)

Haulage Cycle	↓ Window	Inside Cab at Operator's Right Ear				Outside Cab at Mirror
		Precision Sound Level Meter, B&K, Type 2209 Level Recorder, B&K, Type 2306			Noise Dose Meter B&K, Type 4425	Noise Dose Meter B&K, Type 4425
		Standard		Graphical		
		E. I. *	L_{eq} (dBA)**	E. I.	L_{eq} (dBA)	E. I.	E. I.
1	O	0.026	94.7	0.033	95.5	0.13	0.68
2	O	0.020	94.8	0.034	95.8		
3	C	0.023	94.2	0.025 +	94.5		
4	C	0.021	93.4	0.021	92.4		
Average		0.0225	94.3	0.028	94.5	0.0325	0.17

↓ O = Open; C = Closed.

* Exposure Index.

** Equivalent Continuous Sound Level.

\+ See Evaluation in Appendix 2.

the same. The average was:

E.I. = 0.027 per haulage cycle

Leq = 95.2 dBA

The calculation of the Equivalent Continuous Noise Level (Leq) can be based on measurements made during sampling periods judged to be typical of the working day.

In one shift the driver does 20-21 cycles plus the regular fill-ups. This is why we enter 22 cycles in our calculations. The exposure index is 0.59. On the TEREX 45 with a muffler, seven haulage cycles were measured (Table 6). The results were evaluated by standard and graphical methods. The graphical method gave a somewhat higher result because the average levels on paper tape were estimated and marked with pencil. If the results are higher there is nothing wrong with the over-protection that would result except that it tends to make hearing protectors less acceptable to the wearers. Over-protection in moderate noise exposures causes too much interference with voice communications thereby reducing the willingness of personnel to wear the protectors.

The average of all results obtained was:

E.I. = 0.0103 per haulage cycle

Leg = 89.9 dBA

In one shift the driver's Exposure Index was 0.23. If we compare the values of the Exposure Index between a muffled and unmuffled TEREX 45, we observe that the home-made muffler has achieved the desired goal.

3.4 Time Study

During the measurements of haulage cycles from 10:20.5 am to 11:10.7 am it was noticed that there was a steady increase in the waiting time for loading (Figure 4). After the fourth haulage cycle the waiting period was 5.7 minutes. The loader was slow because smaller pieces of stone had

TABLE 6

Noise Exposure Index
TEREX 45 Truck with Muffler

Haulage Cycle	* Window	Inside Cab at Operator's Right Ear				Outside Cab at Mirror
		Precision Sound Level Meter, B&K, Type 2209 Level Recorder, B&K, Type 2306				GR 1944 Noise Exposure Monitor
		Standard		Graphical		
		E. I. **	L_{eq}(dBA)+	E. I.	L_{eq}(dBA)	E. I.
1	O	0.008	88	0.0096	90.5	0.08
2	O	0.012	90	0.011	89.5	
3	O	0.011	90.2	0.02	92.3	
4	C	0.010	90.2	0.009	90.3	
5	C	0.007	88.4	0.008	89.3	
6	C	0.007	88.4	0.011	90	
7	C	0.008	89.3	0.009	89.3	
Average		0.009	89.2	0.011	90.2	0.011

Outside Cab at Mirror
GR 1944 Noise Exposure Monitor
E. I.
0.69
0.0986

* O = Open; C = Closed.
** Exposure Index.
\+ Equivalent Continuous Sound Level.

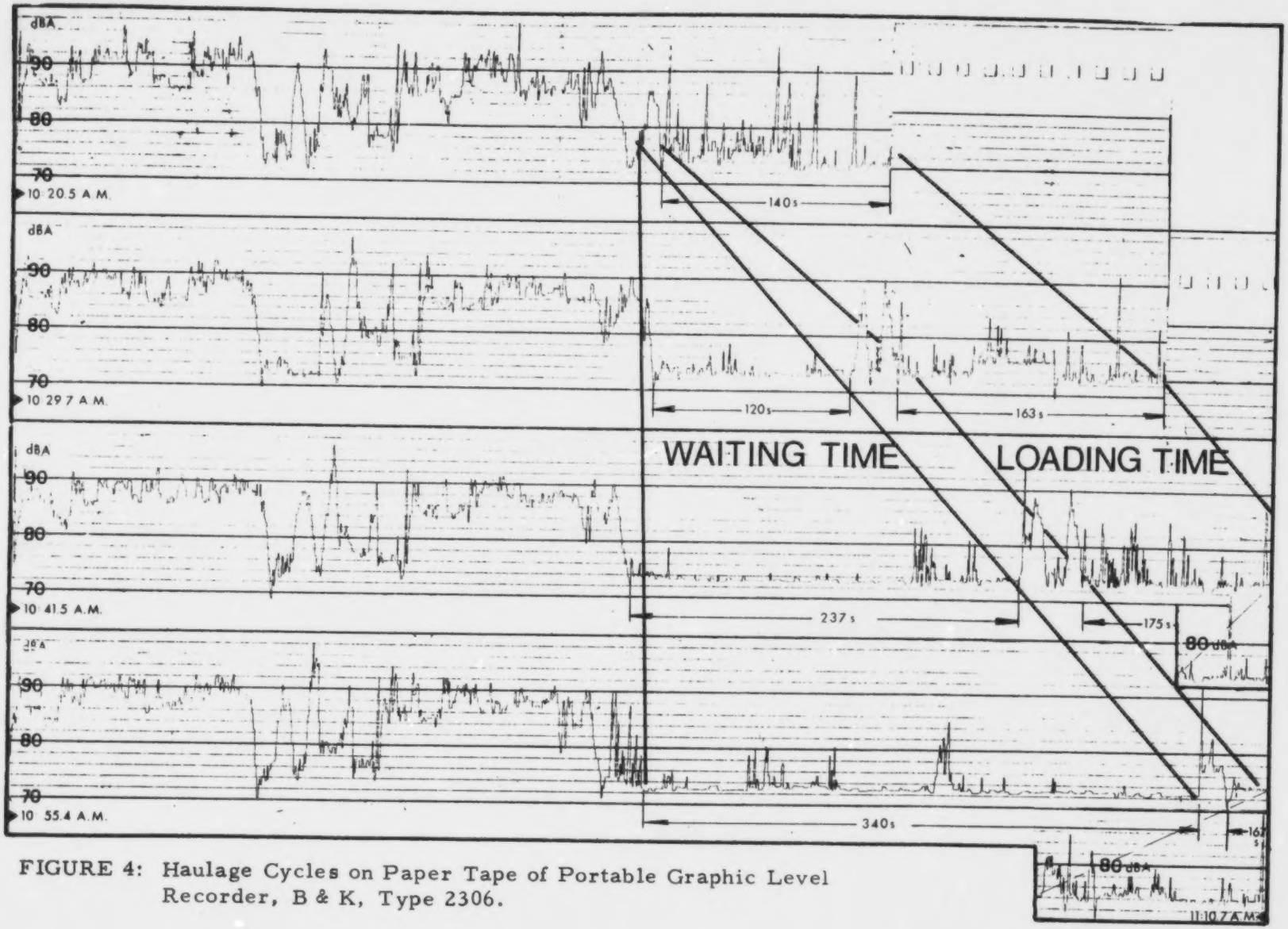


FIGURE 4: Haulage Cycles on Paper Tape of Portable Graphic Level Recorder, B & K, Type 2306.

to be picked out for loading. Four haulage cycles lasted 50.2 minutes.

Drivers claimed that in one shift they make 20-21 haulage cycles. If we take full working time to be six hours and four haulage cycles last 50.2 minutes, we should expect that drivers would make 28 haulage cycles in one shift. The loading is the reason that production is slowed down.

From Figure 4 it can clearly be seen from the level graph on paper tape that all aspects which interest production and management can be followed with great accuracy: sppeding, speed, slowing down, gear, reverse loading, unloading, etc. The accuracy for the preceding is to one second.

This system of noise measurement could be applied for the rational control of motorized transportation of ore and waste, in open pit and underground mines to reduce queuing time to an absolute minimum. The suggested system is simple and inexpensive.

4. CONCLUSIONS

For the first time, measurements were performed with several instruments and by two independent investigators. The result gave close agreement. It has been shown that with short-time measurements, and corresponding instrumentation, a reliable evaluation of the noise environment is possible. The strip chart recordings of noise level versus time can also be used by management in production organization and development.

The attenuation of the home-made muffler could be improved by increase in size.

The WABCO 85 produced less noise at engine W.O.T., than the TEREX 45 and TEREX 50. At engine "Idle" the WABCO 85 made more noise at the front and at the right side, and same noise at the rear and at the left side as did the TEREX 45 and the TEREX 50. The noisiest truck was the TEREX 50. The TEREX 45 and the TEREX 50 operators must wear hearing protectors.

5. RECOMMENDATIONS

(1) Home-made muffler should be improved.

(2) Acoustical insulation of the TEREX 45 and the TEREX 50 cabs should be improved.

(3) In the open pit, measurements should be made on other haulage cucles. The results obtained can be used for a long period of time because the calculated Equivalent Continuous Noise Level remains constant and the Noise Exposure Index is measured with a stop-watch. A wristwatch with a second hand can be used to time the measurement. Stop-watch accuracy is not essential.

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7. ACKNOWLEDGEMENTS

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APPENDIX 1

ELLIOT LAKE LABORATORY, CANMET, E.M.R.

Plant-Noise Survey Form

DATE: Nov. 08, 1975
METER #: 2205 B&K

LOCATION: Cab

NUMBER OF PERSONNEL EXPOSED: 1

WEARING EAR PROTECTION? ☐ yes ☑ no

OPERATOR: B. Fournier

Equipment Truck TEREX 45
Manufacture General Motors
Steel type
Length (m.)
Bit type
Muffler type without
Air kPa
Water kPa
Airflow m³/min.
Blow rate (blow/min.)
Penetration m./min.
Rock type

DIAGRAM:
(Show measuring location with an X.)

NOTES:

	dBA MAX LEVEL	EXPOSURE TIME If necessary, note time of day	C TOTAL DURATION IN HOURS PER DAY	T PERMISSIBLE HOURS PER DAY	C/T
MAXIMUM LEVELS AS MEASURED ON THE "A" SCALE OF THE SOUND LEVEL METER. IF THE READING IS BETWEEN LEVELS SPECIFIED, USE THE HIGHER LEVEL.	OVER 115	One haulage cycle		NONE	
	115			¼	
	110			½	
	105			1	
	102			1½	
	100		.0022	2	.0011
	97		.0355	3	.0118
	95		.0216	4	.0054
	92		.0249	6	.0041
	90		.0027	8	.0003
	UNDER 90			ANY	0

IMPACT CHECK (MUST BE UNDER 140 dB PEAK SOUND PRESSURE LEVEL AS MEASURED WITH AN IMPACT NOISE ANALYZER, OR BE UNDER 120 dB AS MEASURED WITH A SOUND-LEVEL METER ON C WEIGHTING, FAST RESPONSE, 140 dB FULL SCALE RANGE

MAX- dB(C)

TOTAL .0227

To comply with regulations, total cannot be more than 1.

RECOMMENDATIONS:

SIGNED: Percy Leich

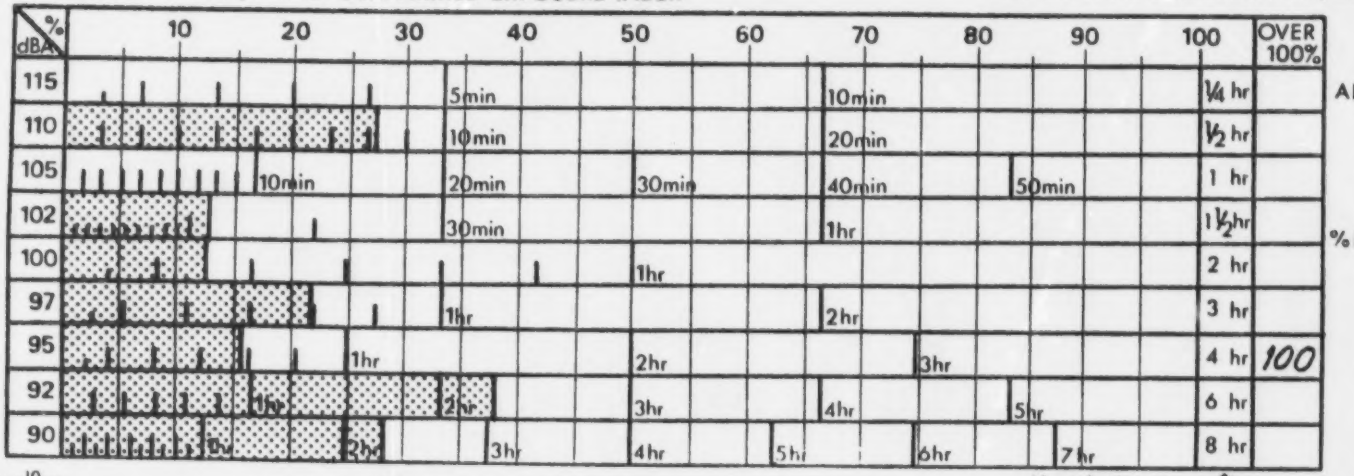
LOCATION: Cab of Truck TEREX45, G.M., without Muffler

NOISE SURVEY FORM

METHOD OF CALCULATING OSHA MIXED EXPOSURE INDEX

ELLIOT LAKE LABORATORY, CAN-MET, E.M.R.

SHEET: 3
DATE: Nov. 08 1975



ADD EXPOSURE VALUES

250

% PERMISSIBLE EXPOSURE

DIVIDE BY 100

TO OBTAIN

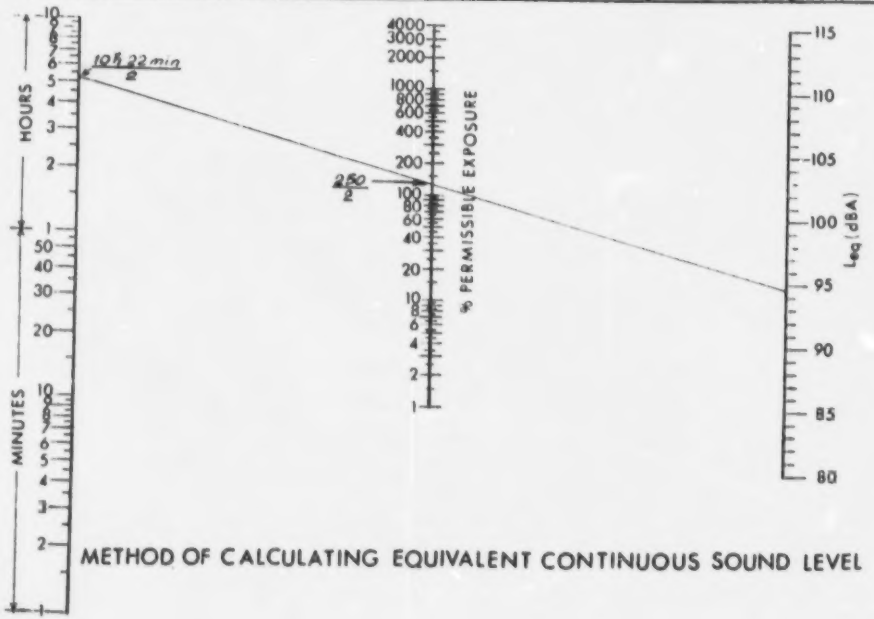
2.5

Real Value

OSHA 0.025

EXPOSURE INDEX

Σ TIME ▶ Hours 10 Minutes 22 OSHA



METHOD OF CALCULATING EQUIVALENT CONTINUOUS SOUND LEVEL

One haulage cycle (6 min. and 13 s.)

The equivalent continuous sound level → Leq = 94.5 dBA

INSTRUMENT: Sound Level Meter, B&K, Type 2209
and Level Recorder, B&K, Type 2306

RECOMMENDATIONS: Truck operator should wear ear protectors (21 cycles, E.I. = 0.52 > 0.5)

Note: The results of the measurements are multiplied by 100 to facilitate the reading of values on the graph. The final result is divided by 100 to obtain the real value.

SIGNED: Aimay Smith

ELLIOT LAKE LABORATORY, CANMET, E.M.R.

Noise Survey Form

B & K 166 Environmental Noise Classifier

Test must coincide with full work shift.

Date: Nov. 08, 1975

Time from one haulage cycle

Location: Cab

Made by: Brüel au Kjaer

Instrument No. _____

Base Line set at 90 dB (normally 90) and Weighting Selector set at dBA.

Total test time 8.2 minutes

EQUIPMENT TESTED (SEE OTHER SIDE FOR DETAILS):

Truck TEREX 45, GM, without muffler

SHEET: 1

Exposure in Minutes												
90 to 92 dBA	92 to 95 dBA	95 to 97 dBA	97 to 100 dBA	100 to 102 dBA	102 to 105 dBA	105 to 107 dBA	107 to 110 dBA	110 to 112 dBA	112 to 115 dBA	Over 115 dBA to 120	Over 115 dBA to 125	Exposure Value (%)
480 420 360 300 240 180 120 60	320 280 240 200 160 120 80 40	240 210 180 150 120 90 60 30	160 140 120 100 80 60 40 20	120 110 100 90 80 70 60 50 40 30 20 10	80 70 60 50 40 30 20 10	60 50 40 30 20 10	40 35 30 25 20 15 10 5	30 25 20 15 10 5	20 15 10 5	Not Permissible		130 120 110 100 90 80 70 60 50 40 30 20 10
5	2.3	10	17	1	—	—	—	—	—			
1.2	8	5	13	1	—	—	—	—	—			

1. Enter time in minutes from counters on the 166. multiplied by 10
2. Enter Exposure Value (%) from right-hand column corresponding to minutes in table.

3. Add Exposure Values 2.82 = % Permissible Exposure

4. Divide % Permissible Exposure by 100 to obtain OSHA Mixed Exposure Index 0.028

Number of personnel exposed: 1

Wearing ear protection? ☐ yes ☑ no

RECOMMENDATION: .....

SIGNED: Hiroy Reich

VOL. 3A Report 4

77-36 M. Savich

Noise measurement in No. 12 mine,

Brunswick Mining and Smelting

1976

MESURES DU BRUIT À LA MINE N° 12 DE LA BRUNSWICK MINING AND SMELTING

M. Savich*

RÉSUMÉ

On a effectué des mesures de l'exposition au bruit à la mine n° 12 de la Brunswick Mining and Smelting Corporation Limited en vue de déterminer les niveaux de bruit auxquels les travailleurs souterrains étaient exposés et de déterminer les possibilités futures de protection de l'ouïe. Les exigences de l'OSHA ont été utilisées comme guide pour la réglementation en matière d'émission de bruit.

On a mesuré l'émission de bruit dans la mine sur les machines qui produisent le plus de bruit : concasseurs à mâchoires, foreuses sur béquilles, marteaux-stopers, chariots de foration, jumbos, jumbos à trois perforatrices, foreuses au diamant et foreuses de cheminées. On a aussi mesuré le niveau de bruit des ventilateurs et des systèmes de ventilation, de même que du matériel de roulage. On a de plus effectué des mesures dans d'autres environnements miniers. On a évalué, sur le terrain et en laboratoire, l'atténuation du niveau de bruit des serre-tête antibruit utilisés dans la mine n° 12.

Les résultats des mesures ont montré que les niveaux de bruit étaient très élevés et que de nombreux travailleurs étaient surexposés.

Les principaux problèmes relatifs à la réduction du bruit dans la mine n^{o} 12 sont dus à la difficulté de mesurer l'indice d'exposition pendant un quart complet et au fait que les serre-tête antibruit sont peu portés. On devrait immédiatement élaborer une méthode de détermination de l'indice d'exposition au bruit basée sur des mesures faites pendant une courte période et établir des moyens de contrôle pour s'assurer que les serre-tête antibruit sont portés suffisamment.

Mots clés : bruit, mesure, exposition, serre-tête antibruit, mine

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NOISE MEASUREMENTS IN NO. 12 MINE, BRUNSWICK MINING AND SMELTING

by

M. Savich*

ABSTRACT

Noise exposure measurements were performed in No. 12 Mine, Brunswick Mining and Smelting Corporation Limited for the purpose of determining the noise levels to which the underground employees were exposed at the time, and to determine future prospects for hearing conservation. OSHA requirements were used as a guideline for the regulation of noise emission.

Measurement of sound emission was performed in the mine on the machines which produce the most noise: jaw crusher, jacklegs, stopers, stope wagons, stope jumbos, three drill jumbos, diamond drills and a raise boring machine. Also, the noise level of fans and ventilation systems, of haulage equipment, and in other mining environmental areas was observed. Sound level attenuations of ear muffs used in No. 12 Mine were evaluated in the workplace and in the laboratory.

The results of the measurements showed very high noise levels and that many men were over-exposed.

The main problems encountered in noise control of the No. 12 Mine are caused by difficulty in measuring the exposure index during a full shift, and by poor wearing of ear muffs. A method using short measurements for the determination of noise exposure index and modes of control for good ear muff wearing should be immediately developed.

Key: Noise, Measurement, Exposure, Ear Muff, Mine

* Research Scientist, Elliot Lake Laboratory, Mining Research Laboratories, Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake, Ontario.

CONTENTS

Abstract ---------- i

1. Introduction ---------- 1
   1.1 Hearing Loss from Noise Exposure ---------- 1
   1.2 Hearing Loss Criteria ---------- 3
   1.3 Regulations and Code ---------- 5

2. Field Measurements : Equipment and Technique ---------- 7
   2.1 Instruments ---------- 9
      2.1.1 Sound Level Meter ---------- 9
      2.1.2 Noise Exposure Monitor or Dosimeter ---------- 10
      2.1.3 Statistical Analysis ---------- 11
   2.2 Technique for Analysis of Results ---------- 11

3. Measuring and Monitoring Noise with Noise Dosimeters and Noise Classifier to Comply with the OSHA ---------- 13
   3.1 Evaluation of Noise Dosimeters in the Laboratory ------ 14
   3.2 The Accuracy of the Noise Dosimeters ---------- 15
   3.3 Analysis of Noise Exposure Index ---------- 16
      3.3.1 Comparison of Effects of dBA Variation on Percentage Reading between Seven New Noise Dosimeters ---------- 16
      3.3.2 Noise Exposure Tests in the Mine ---------- 17
   3.4 Statistical Sampling Techniques ---------- 24

4. Noise Levels of Diesel Powered Underground Mining Equipment ---------- 25
   4.1 Noise Levels and Engine Types - Near Field Test ------ 25
   4.2 Methods of Measurement of Noise Emitted by Underground Vehicles ---------- 30
   4.3 Noise Exposure of Operators and Machines Responsible for the Noise ---------- 36

5. Noise Control in Ventilation Systems ---------- 39
   5.1 Field Tests or Acceptance Tests ---------- 39
   5.2 Comparison of the Predicted Results with Measured Results ---------- 41
   5.3 Noise Control ---------- 54

6. Crushing Plants ---------- 57
   6.1 Jaw Crusher ---------- 59
   6.2 Storage Bins ---------- 62
   6.3 Noise Exposure of Operators in Crushing Plants ------- 63

7. Rock Drills and Associated Equipment ---------- 64
7.1 Jacklegs ---------- 65
7.2 Stoper ---------- 68
7.3 "Wills" Stope Wagon (IR - 300) ---------- 71
7.4 630 Stope Jumbo ---------- 79
7.5 Jumbos, Three Drills ---------- 87
7.5.1 Noise Exposure of Operator and Helper from the Development Jumbo ---------- 93
7.6 Diamond Drilling ---------- 96
7.6.1 Noise Measurement at the HW Exhaust Drift, 2350 Level ---------- 97
7.6.2 Noise Measurement at F-IN Drift, 1900 Level - 102
7.6.3 Noise Measurement at 1900 Level 1 Sub W.O.Z. F-1 South (Timber Storage)---------- 111
7.7 Raise Boring Machine ---------- 117
7.8 Noise Exposure of Operators from Rock Drills and Associated Equipment ---------- 121

8. Sound Level Attenuation of Ear Muffs Used in No. 12 Mine - 123
8.1 Control of Attenuation of Ear Muffs in the Workplace -- 124
8.2 Accuracy of Measurements ---------- 132
8.3 Measurement of the Attenuation of Ear Muffs in the Laboratory ---------- 132
8.3.1 Instrumentation ---------- 134
8.3.2 Subject Selection ---------- 135
8.3.3 Test Procedure Using Human Heads ---------- 135
8.3.4 Test Procedure and Apparatus for Determining the Efficiency of Cup Cushions ---------- 137
8.3.5 Test Data and Discussion ---------- 137

9. Conclusions ---------- 142

10. Recommendations ---------- 148

11. Acknowledgements ---------- 153

12. References ---------- 154

FIGURES

1.1	Mean Audiogram of Employees Exposed to Industrial Noise (1)	2
2.1	Instrumentation used for Noise Dose Measurement in Mines	8
2.2	Each range of the 166 Environmental Noise Classifier is divided into 11 classes of alternate 2- and 3-dBA widths as shown. The 12th classification indicates levels higher than the 11th band	12
4.1	Comparison of Near-Field Exhaust Octave Band Noise Data, and Data at the Operator's Station on ST4A Scooptram (VL 042)	29
4.2	Noise Levels in a Tunnel can be 2 to 3 dBA greater than Aboveground Levels for the ST4A Scooptram Wagner	30
5.1	Sound Pressure Level of Noise from Casing of Axial-Flow Fan by Observing a Hand Meter	42
5.2	Calculating Reverberant Field Decay (Room Constant, R)	44
5.3	Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL)	45
5.4	Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL)	46
5.5	Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL)	47
5.6	Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL)	48
5.7	Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL)	49
5.8	Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL)	50
6.1	Jaw Crusher at the 2950 Ft. Level	58
6.2	Typical Recorder Trace for Jaw Crusher. Accuracy Evaluation Comparisons between Standard and Graphical Methods	60
6.3	Frequency Spectrum of Noise at the Jaw Crusher	61
7.1	Muffled Drills reduce the all-pass Noise Level (23)	66
7.2	Noise Histograms of each Hole at 8 Ft. depth are similar. When the new OSHA requirements are fulfilled the Noise Exposure Index will rapidly rise	72

7.3	The Acoustic Energies only over the audible Range of Frequency (250 Hz to 2000 Hz) are equal ----------	73
7.4	Octave Band Noise Data at the Wills Wagon Operator's Station. No. 3 and 4 Data are from Jack Leg Drills (28) -	78
7.5	Typical Recorder Intermittent Noise Trace of 630 Stope Jumbo, Two Drills BBC 100F ----------	85
7.6	Noise Levels from Vehicles to which the 630 Stope Jumbo Operator was Exposed to on 44 FW Stope, 1400 Level ---	86
7.7	Comparison of Octave Band Noise Data under different Mining Conditions ----------	88
7.8	Sound Pressure Level Spectral Analysis of Noise from Development Jumbo ----------	94
7.9	Diamond Driller Noise Exposure Histograms. Drilling Machine : Boyles VEG Diamond Drill at the HW Exhaust Drift, 2350 Level ----------	98
7.10	Diamond Driller Shift Histogram ----------	99
7.11	Blasting during Lunch Time Observation on 2350 Level, HW Exhaust Drift ----------	101
7.12	Comparison of Octave Band Noise Data between unmuffled and muffled Air Exhaust Pipe from Diamond Drill -------	103
7.13	Octave Band Noise Data of Diamond Drilling Machine ----	104
7.14	Diamond Driller's Noise Data ----------	105
7.15	Work Time Study with Noise Signal in dBA from Strip Chart Recording ----------	107 108
7.16	Diamond Driller Shift Histogram : the end of one hole, and the beginning of a new hole ----------	112
7.17	Graphical Explanation : Time, Permissible Exposure and Equivalent Continuous Sound Level per 5 Ft. Rod from Measurements in the No. 12 Mine ----------	114
7.18	While Drilling a Shallow and Deep Hole, Noise Levels Differed Considerably over all Frequencies ----------	115
7.19	Octave Band Analysis of Diamond Drilling Machine under a different Load ----------	116
7.20	Octave Band Noise Data from Raise Boring Machine. The Sound Energy is concentrated from 125 Hz to 1000 Hz.	119
7.21	Typical Recorder Trace for a Raise Boring Machine during One Shift ----------	120

8.1	Block Diagram of Experimental Apparatus ----------	134
8.2	David Clark Co., Straightaway, Hearing Protector, Model E-705, No. 1. ----------	138
8.3	American Optical, Hear Guard Model 1775, No. 4. ----	139
8.4	David Clark Co., Straightaway, Hearing Protector, Model E-805, No. 6. ----------	140
8.5	Hellberg Protection A. B. No-Noise Ear Cup Kit, No. 8.	141

TABLES

1.1	OSHA Noise Standard - Permissible Noise Exposure ---	6
3.1	The Effect of dB Error on Percent OSHA Exposure Measurement ----------	15
3.2	Comparison of Permissible Exposure Values in Percent between Seven Noise Dosimeters ----------	18
3.3	Noise Exposure Index in Mine No. 12 ----------	19 to 21
4.1	Near Field Test - Noise Levels of Haulage Equipment in No. 12 Mine ----------	26
4.2	Noise from Diesel-Powered Machines in Relation to Horsepower ----------	27
4.3	Noise Levels of a Moving Vehicle on 1900 Level, W.O.Z. No. 1 SUB ----------	32
4.4	Noise Levels of a Moving Vehicle on 1900 Level, W.O.Z. No. 3 SUB ----------	33
4.5	Noise Levels of a Moving Vehicle on 1900 Level, W.O.Z. No. 3 SUB ----------	34
4.6	Noise Levels of a Moving Vehicle on 2107 Level -------	35
4.7	Noise of Front End Loader 466C, 2350 Level ---------	37
4.8	Permitted Noise Duration of Noise at Different Vehicles	38
5.1	Evaluation of Over-all Sound Power Levels (PWL) from Fans in No. 12 Mine ----------	52
5.2	Octave Band Measurements of Noise from Fans in No. 12 Mine ----------	53
5.3	The Frequency of the Fundamental Discrete Blade Passing Tunes from Fans in No. 12 Mine ----------	55
5.4	Analysis of Noise Levels Generated and Noise Control Treatment of Fans in use in No. 12 Mine ----------	56

6.1	Permitted Duration of Noise in Crushing Plants (Figure 6.1)	64
7.1	Comparison of Noise Data Between Muffled and Non-Muffled Drills	67
7.2	Noise Exposure Index and Noise Data from Stoping	70
7.3	Correction of the Noise Exposure Index from Table 7	71
7.4	Noise Exposure Index of Wills Wagon Stope Wagon Operators	75
7.5	Analysis of Noise Exposure Index for Wills Wagon Operator	76
7.6	Evaluations of Noise Exposure Index from 630 Jumbo Operator	80
7.7	Correction of the Noise Exposure Index from Table 7.6	81
7.8	Noise Exposure Index Evaluations in Relation to Set Observations, 48 H.W. Stope W.O.Z., November 7, 1975	82
7.9	Noise Exposure Index Evaluations Related to Set Observations, 44 W Stope, 1400 Level, November 11, 1975	84
7.10	Permitted Noise Duration of 630 Stope Jumbo	87
7.11	Measurement of Noise Exposure Index at Development Jumbo Operator's Ear	89
7.12	Noise Exposure Index of the Jumbo (ES-300) Operator Including Intervals from 115 dBA to 120 dBA	90
7.13	Comparisons of Noise from Drills by Jarvis Clark Jumbos	92
7.14	Permitted Duration of Noise in Development Jumbo in Practice and in Theory	95
7.15	The Noise Exposure Index and Equivalent Continuous Sound Level by Adding the Effects of Each Set of Operations	100
7.16	Evaluation of Noise Exposure Index and Equivalent Continuous Sound Level from Figure 7.17	109
7.17	Evaluation of the Noise Exposure Index and the Equivalent Continuous Sound Level from Figure 7.18	113
7.18	Permitted Noise Duration at Operator's Ear from Rock Drills and Associated Equipment	122
8.1	Determinations of Sound Level Attenuation of Ear Muffs in No. 12 Mine	127 to 130
8.2	Accuracy of Sound Level Attenuation Measurements of Ear Muffs in No. 12 Mine	133

8.3 Attenuations of Ear Muffs Using Human Heads in the Laboratory ---------- 136

8.4 Technical Data of Ear Muffs in No. 12 Mine ---------- 143

APPENDICES

1. Noise Survey Form : ST4A Scooptram Wagner --------- 1A

2. Noise Survey Form : Crusher Operator 2950 Ft. Level - 2A

3/1 Work Study Record : Diamond Drilling ---------- 3A

3/2 Work Study Record : Diamond Drilling ---------- 4A

4 Plant-Noise Survey Form : Raise Boring Machine ------ 5A

1. INTRODUCTION

As a part of the noise abatement program being conducted by the Noranda Research Centre, comprehensive noise surveys were planned in select Noranda Mines. Discussions with CANMET indicated a common interest in assessing noise in Canadian metal mines, so a joint program was established.

Noise measurement in No. 12 Mine is directed toward the following objectives:

1. To identify all underground jobs with exposure indices of 1.0 or greater and determine as accurately as practicable an index value for each of these jobs.

2. To identify major features of operation or site that govern the noise level observed.

3. To obtain representative full octave band analyses of noise for all underground jobs with noise exposure levels of 110 dBA or greater.

4. To determine sound level attenuation of ear muffs used in the mine, under working conditions.

The scope of this report is to establish the types of noise environments to which an operator of mines or heavy equipment might conceivably be exposed.

1.1 Hearing Loss from Noise Exposure

Occupational deafness is irreversible hearing loss (the permanent threshold shift - PTS). Hearing loss for a given sound is the difference in

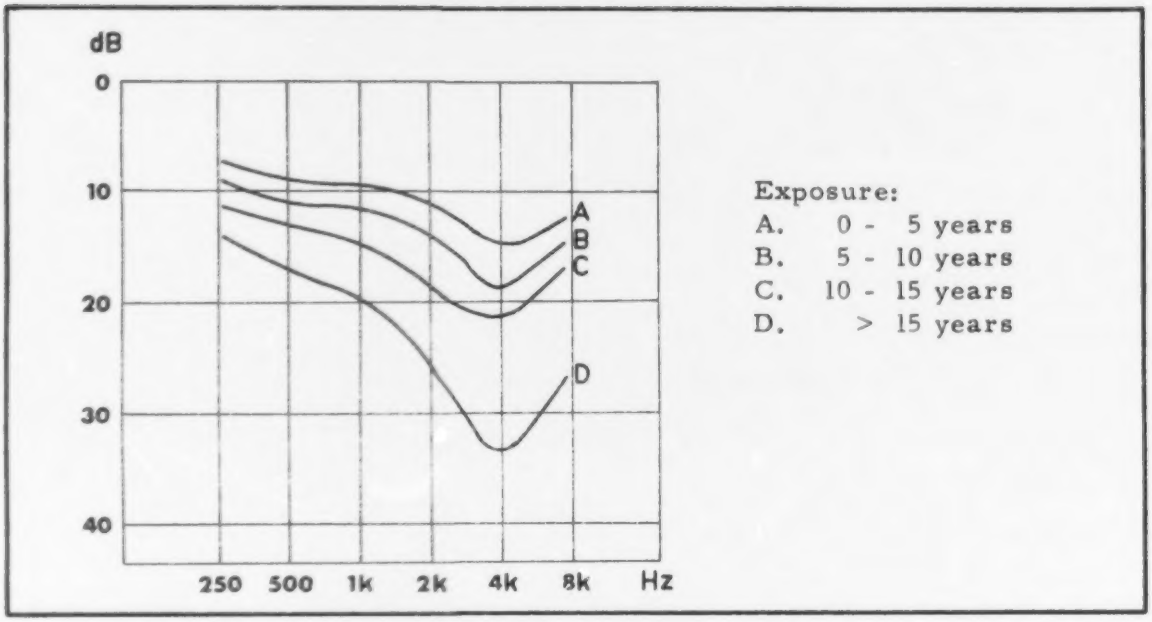


Figure 1.1: Mean Audiogram of Employees Exposed to Industrial Noise (1).

decibels between the hearing threshold for that sound and the threshold of hearing. Audiometric testing of miners who have been subjected to prolonged exposure to high noise levels will reveal enfeeblement of hearing acuity in the higher frequency ranges between 3000 and 6000 Hz (Figure 1.1) (1).

A noise-induced hearing loss initially damages the sensitive hair cells in the organ of the Corti, causing a loss of acuity at 4000 Hz, and abbreviated as the C_5 dip (C_5 on the musical scale has a frequency of 4096 Hz). If a person's ability to hear conversational speech has not been affected, the hearing loss goes undetected in its temporary stage (the temporary threshold shift - TTS). These two types of hearing loss have many gradations between them. In evaluating noise-induced hearing loss, the PTS should be measured after recovery of TTS, and PTS should be

measured after termination of exposure, or before work commences.

A noise-induced hearing loss generally affects both ears in persons under 40 years of age. Some individuals seem more sensitive to loud sound than others (2). When examining the hearing of a mining or industrial community, the various non-occupational causes of hearing loss, in particular infection, during intoxication and presbycusis, should be kept in mind.

1.2 Hearing Loss Criteria

Mining (industrial) noises are a complex mixture of several notes having their individual frequencies, intensities, and distribution in time. The different types of noise are:

a) continual wide-band noise, i.e., noise including a wide range of frequencies, e.g., general mining or machine shop noise;

b) continual narrow-band noise, i.e., the sound energy is concentrated in a few frequencies, e.g., drill hammers and circular saws;

c) impact or impulse noise, i.e., short duration impulses, e.g., tapping and hammering(the noise is a change in sound pressure level of 40 dB or more within 0.5 seconds);

d) steady-state (continuous) repeated impact noise where a change in sound pressure level is less than 40 dB between successive 0.5 intervals, e.g., rivetting and breaking;

e) intermittent noise where there are several periods of steady-state noise with intervals of ambient noise, e.g., traffic and drilling noise.

Using time and level as the measure, there are four classes into

which occupational noise exposures may be grouped:

1. long-term continuous noise,
2. short-term continuous noise,
3. intermittent equal-intensity noise, and
4. intermittent variable-intensity noise.

Long term continuous noise is defined as noise of a constant level and spectrum to which a listener is exposed for 6 to 8 hours per day, 40 hours per week, 50 weeks per year. Most criteria are written for this type of operator exposure noise.

Short-term continuous noise is defined as broad-band noise at a constant level for less than 5 hours per day, 5 days per week, for life. The octave bands 500, 1000, and 2000Hz are considered, because these bands are of importance in the protection of hearing for speech.

Intermittent equal noise exposure is defined as exposure time to a given broad-band pressure-level intermittently during a normal working day.

Intermittent variable noise is defined as broad-band noise which is intermittent in time duration and variable in both duration of "on" and "off" time and absolute magnitude. Two basic methods are currently available. The equal-energy theory (3) reasons that hearing-damage risk is determined by the total amount of energy for each day (8 hr). For half-day exposure (4 hr), 3dB greater noise levels are permissible for the same risk. Each halving of energy permits adding 3 dB to the noise levels permissible. The equal temporary effect theory (the temporary threshold shift - TTS) (3) is based on the observation that those noise exposures which ultimately

produce permanent hearing loss also produce temporary hearing loss in young ears. Sataloff, Vassallo, and Mendulse (3, found that underground iron ore miners exposed intermittently to intense rock drill noise showed no greater hearing damage to noise exposure than do mill workers exposed to steady noise 20 dB lower. Other reports of hearing damage to miners agree with Sataloff et al. (3, 4). Intermittent variable noise is the most common noise in a mining and metallurgical environment.

1.3 Regulations and Code

The noise exposure may be specified as being the constant sound level for its duration. If the sound level varies with time, the mean-level must be obtained by calculation. The permissible noise levels refer to sound pressure levels that represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech (Table 1.1).

The sound level shall be determined by a sound level meter, meeting the standards of the United States of America Standards Institute and operating on the A-weighting Network with slow meter response. The A-weighting scale is used to measure hazardous noise because it discriminates against the low frequencies and more closely simulates the response of the human ear than other weighted scales.

The new proposed standard still limits an employee's exposure to 90 dBA, as an eight hour time-weighted average (Federal Register, Vol. 39 No. 207, October 24, 1974). However, it requires identification of all sources generating noise levels in excess of 85 dBA and audiometric

TABLE 1.1

OSHA[+] Noise Standard - Permissible Noise Exposure

Duration per Day Hours	Sound Level dBA*
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115**

* Sound Level Meter on the slow-response setting.
** Ceiling value.

testing of all employees exposed to 85 dBA and greater for 8 hours a day.

OSHA will continue to limit exposure to impulse noise to 140 dB peak sound pressure level. The proposed standard will make use of an exponential scale for noise levels and frequency of impulses. The number of impulses allowed at 140 dB would be 100 per day. For 130 dB, the number of allowable impulses would be 1000 per day. For each 10 dB decrease in impulse noise level, the number of impulses to which employees are exposed may be increased by a factor of 10.

The OSHA Standard has established the following priorities for compliance;

1. Feasible engineering controls such as reducing the noise at the

[+]Occupational Safety and Health Administration (U.S.A.).

source, along the path, or in the employee's hearing zone.

2. Feasible administrative measures by limiting the exposure of the employee to noise through job rotation and production scheduling.
3. Hearing protectors used as a temporary means of limiting noise exposure until engineering controls and administrative measures are implemented.

Where the engineering and administrative controls which have been implemented do not reduce the sound levels to within the permissible limits, the employer shall continue to develop and implement engineering and administrative controls as they become feasible (OSHA).

It was agreed to use OSHA criteria since New Brunswick regulations were being revised at the time the survey was conducted.

2. FIELD MEASUREMENTS: EQUIPMENT AND TECHNIQUE

The measurement of noise levels should be associated with a noise control problem in a mine or mill. The conditions demanding this data should be established before the measurement project starts. From this information, suitable field and laboratory equipment can be selected (Figure 2.1). Measurements such as these can be made at little cost and effort, simply by introducing noise exposure as a factor in mining and mill production planning.

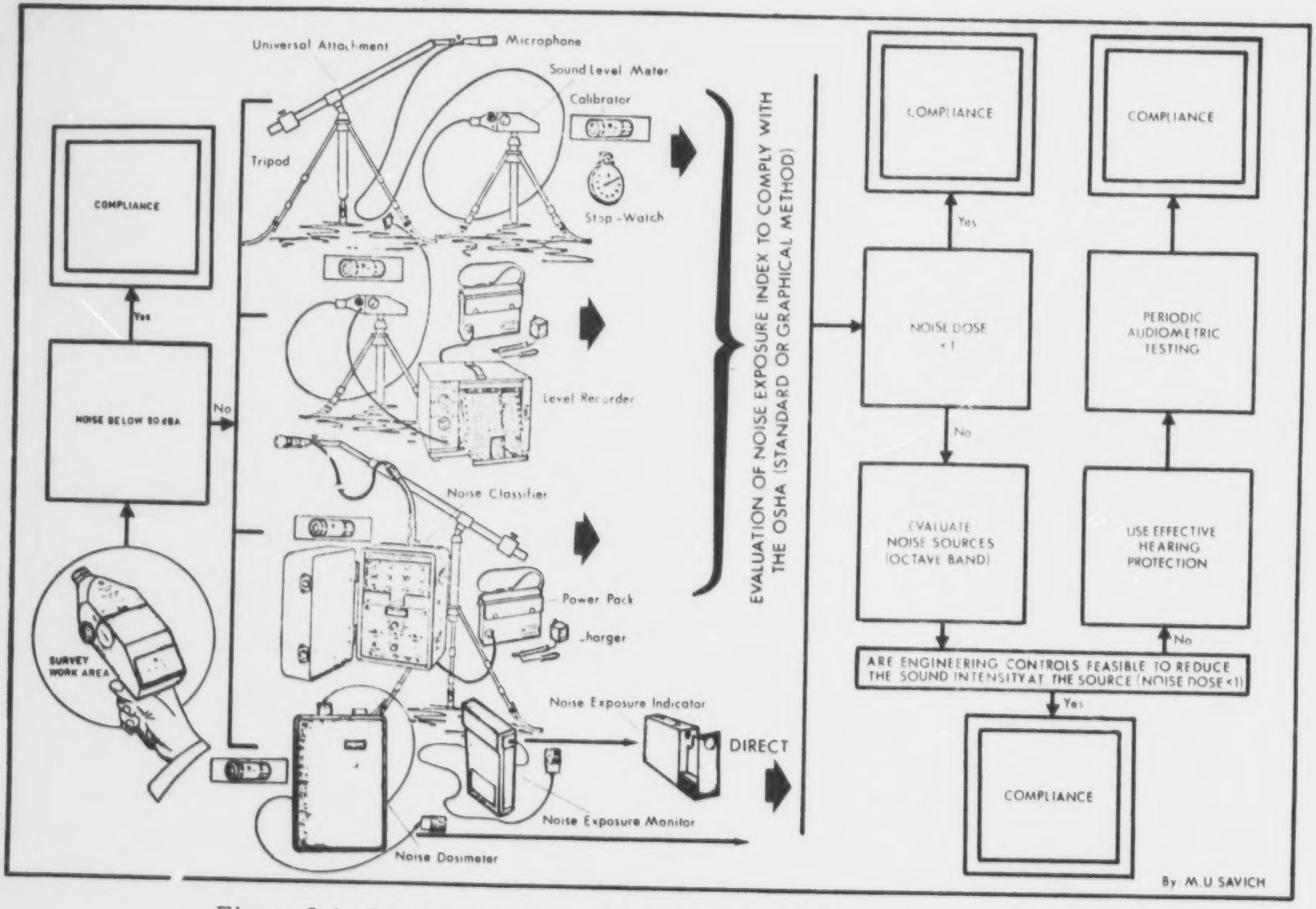


Figure 2.1: Instrumentation used for Noise Dose Measurement in Mines

2.1. Instruments

Instruments are required to determine the noise levels to which underground employees are exposed, to evaluate noise survey techniques and equipment, and to compare noise exposure using a sound level meter and noise dosimeter.

2.1.1 Sound Level Meter

The basic system for measuring sound pressure levels or vibration acceleration levels with a sound level meter consists of the following:

1. Transducer:

(a) The microphone (the Piezolectric Microphone type 4117, B and K, and the Condenser Microphone type 4145, B and K) and calibrator (Pistonphone type 4220 B and K, or Sound Level Calibrator type 4220 B and K, or Sound Level Calibrator type 4230, B and K) (5).

(b) The microphone (electret-condenser, $\frac{1}{2}$-in, 1933-9701, Gen-Rad) and 1562-A Sound-Level Calibrator, Gen-Rad (6).

2. Preamplifier type 2619, B and K (IEC R 327 and ANSI SI. 70-1966) (5).

3. Sound Level Meter (IEC R 123 and ANSI SI. 4-1971) (5):

(a) Sound Level Meter type 2205, B and K, has built-in A,B, and C-weighting networks, "Fast" and "Slow" meter damping; and

(b) Impulse Precision Sound Level Meter type 2209, B and K, has a frequency range 2 Hz to 70 kHz; A, B, C, and D Linear frequency response, octave filter type 1613, B and K, and impulse measurement with max. RMS hold, etc. (IEC R 179): and

(c) 1933 Precision Sound Level Meter, Gen-Rad. (IEC R 123 and NASI SI SI. 4-1971) (6).

Impulse Precision Sound Level Meter which has a frequency range 5 Hz to 100 k Hz; A, B, and C, linear frequency response, octave filter, and impulse measurement with max. RMS hold, etc. (IEC R 179).

4. Level Recorder type 2306, B and K, records DC signal and RMS average or peak value of AC signals as function of time or frequency, from 2 Hz to 200 k Hz (5).

2.1.2 Noise Exposure Monitor or Dosimeter

A sound level survey alone is not enough because most industrial noise levels vary. Critical areas should be continuously monitored during the work day to determine if the duration of high noise levels is longer than that permitted by the OSHA Noise Standard. A special instrument, the noise dosimeter, has been developed. In this case the noise dose may be defined as the constant sound level for the time duration (Equivalent continuous sound level - L_{eq}). This instrument can be divided into two categories:

a) In type A the voltage is converted to a current and used to plate the electrodes of an electro-chemical memory cell. The amount of plating of the cell is then read out as a percentage of exposure (The duPont E-100 Audio Dosimeter (7).

b) In type B the signal from the integration circuit is converted to pulses that are stored and later read out as a percentage of

exposure (Noise Dose Meter, type 4425, B and K; GR1944 Noise Exposure Monitor; and Sound Dosimeter, 60-520, Edmont (8)). The manufacturers of both types of instruments claim compliance with ANSI SI. 4-1971 for Type 2 Sound Level Meters. These instruments are available either in stationary format or in portable versions so they can be carried in the pocket of a worker preferably with the microphone mounted close to his ear.

2.1.3 Statistical Analysis

The B and K Model 166 Environmental Noise Classifier is a self-contained instrument which can be used to obtain the statistical distribution of noise (5). The Model 166 divides the noise level into eleven amplitude classes and one exceedance class. The base line of the analysis can be set from 60 to 100 dB or dBA in nine 5 dB steps. The bands of the noise classifier are alternately 2 and 3 dB wide. The operating ranges are shown in Figure 2.2. Signal excursions above 27 dB range are also recorded, the total time of the test is also recorded. It also complies with ANSI SI. 4-1971 for Type 2 Sound Level Meters.

2.2 Technique for Analysis of Results

The sound level meter and impulse precision sound level meter were used to observe the sound levels. Both instruments were operated on the A-weighted network with slow response and calibrated with the calibrator before and after the shift. Construction of the universal attachment permitted technical development for measuring noise level criteria (Figure 2.1). Sound level measurements were usually taken within one

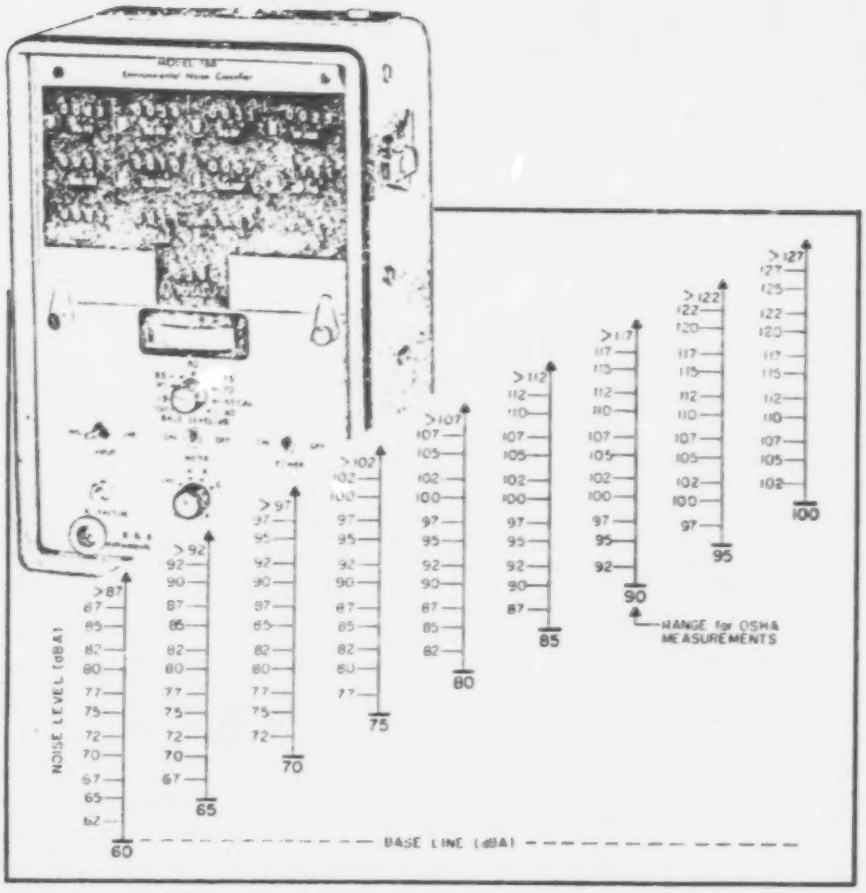


Figure 2.2: Each range of the 166 Environmental Noise Classifier is divided into 11 classes of alternate 2- and 3-dBA widths as shown. The 12th classification indicates levels higher than the 11th band.

meter of the miner's ear. The total duration of exposure time in hours was determined by full-shift time studies and partial-shift studies. The impulse precision sound level meter was connected with a portable meter recorder. The level recorder gave a graphical display of the sound level as a function of time. For frequency analysis an external filter was connected to the impulse precision sound level meter. Records of such surveys show the instruments used, data and location of the test, machinery or equipment generating the noise, and the names of the operators.

The Noise Exposure Dosimeter was fastened on the miner with the microphone as close to the ear as possible.

3. MEASURING AND MONITORING NOISE WITH NOISE DOSIMETERS AND NOISE CLASSIFIER TO COMPLY WITH THE OSHA

Noise Dosimeter — A device worn on the person for determining the accumulated sound exposure with regard to level and time.

Noise Classifier — A portable acoustical amplitude analyzer that measures the time spent in a series of amplitude bands.

Commercial portable noise dosimeters have been designed and developed to determine acceptable noise levels for men working in industry. These instruments perform the measurements with absolutely no effort on the part of the employee.

The noise classifier, or noise analyzer is designed to satisfy the need

for a low-cost, easy-to-use (in rooms, halls or vehicles) community noise analyzer, without the need for tape recorders, calculators, or computers.

In the analysis of noise exposure there are two major factors:

1) A-weighted sound level, and

2) Noise exposure duration and distribution during shift.

The noise exposure consists of the accumulated sound exposure with regard to level and time.

3.1 Evaluation of Noise Dosimeters in the Laboratory

Tests in the Noranda Research Centre were conducted on the following instruments:

1) Noise Dose Meter, type 4425, Bruel and Kjaer (3 units).

2) 1944 Noise Dosimeter, includes 1944-9707 Monitor (2 units). 1944-9702 Indicator, and 1944-9708 Calibration Adaptor, Gen-Rad (1 unit).

3) Noise Dosimeter, model 60-520, Edmont (1 unit).

4) Audio Dosimeter, model D-100, and Readout Model R-150 Du Pont (1 unit).

The purpose of the tests was to investigate inhibition of lower OSHA limit.

Laboratory tests were done in a semi-reverberant room 20 m long, 5 m wide, and 4.5 m high. The room was full of machines. Acoustical tests were performed using a sine random generator, type 1027 B and K, power amplifier, type 2706 B and K, and a loudspeaker.

3.2 The Accuracy of the Noise Dosimeters

The accuracy of personal noise monitoring, whether using an audio dosimeter or sound level meter, is a function of the total tolerance limits for sound at random incidence for a Type 2 Sound Level Meter. The noise dosimeters are specified by a standard for measurement of OSHA criteria. The effect of dBA variation on percentage reading was derived from the standard for General Purpose Sound Level Meters SI. 4-1971, Type 2, and OSHA compliance (Table 3.1).

TABLE 3.1

The Effect of dB Error on Percent OSHA Exposure Measurement

Error dB	Percent Reading when Expecting 100%	Error dB	Percent Reading when Expecting 100%
+6.0	230	-1.0	87
+5.0	200	-2.0	76
+4.0	187	-3.0	66
+3.0	152	-4.0	57
+2.0	132	-5.0	50
+1.0	115	-6.0	43
0	100		

A calculation of deviations was done using "pink noise" from 20 Hz to 10,000 Hz for the input signal spectrum for the A response and again for the upper and lower limits for Type 2 tolerance. The dBA value deviates in the range of +3.4 dBA to -2.1 dBA from the correct noise level (9). Any result between 76% and 160%, will be acceptable if we are expecting 100% noise exposure.

3.3 Analysis of Noise Exposure Index

The Noise Exposure Index was evaluated by using the following instruments (5, 6, 7, 8 and 10):

	Competitor	Instrument	Weight	Range	115 dBA Exceeded	Accuracy	Microphone	Calibration	Power	Temp.	Humidity	Accessories
1.	Brüel and Kjaer	4425 Personal Noise Dose Meter, Type 4230 Calibrator.	0.289 kg	90 dBA to 115 dBA.	Read out by flashing led lamp during noise dose read-out. Storage capacity: 0 to 9999%.	ANSI S1.4-1971, Type S2A	Type 4125 condenser, omnidirectional. Alternative remote mounting of microphone with optional preamplifier.	In calibration mode, 94 dB sound level at 1000 Hz will produce a display count rate of 1 per second.	2 x 9 V NEDA 1604 batteries. Life is 80 hr at 8 hr use per day.	-10°C to +50°C	0 to 90%	Clip-on microphone preamplifier with 1 m cable ZE0132. Tripod UA0049.
2.	E.I. du Pont de Nemours and Co.	Audio Dosimeter and Audio Dosimeter Readout.	0.241 kg	90 dBA to 115 dBA.	Light emitting diode in dosimeter. Storage capacity: 0 to 3200%.	ANSI S1.4-1971, Type S2A	Ceramic Type Shure 99A401B, non-directional.	Factory calibrated - acoustically and electrically.	9V NEDA 1604 battery. Life is 80 hr at 8 hr use per day.	-18°C to +50°C		
3.	General Radio	GR 1944-1 Noise Exposure Monitor, GR 1944-1 Noise Exp. Indicator.	0.210 kg	80 dBA to 120 dBA	Information is stored in the monitor unit and read out on the indicators. Storage capacity: 0 to 999%.	ANSI S1.4-1971, Type S2A.	Ceramic omnidirectional microphone on extension cable.	GR 1944 Noise Exposure Indicator, built-in sound level calibrator.	9V Burgess 2U6 battery or equivalent 9V transistor battery. Life is 180 to 320 hr at 8 hr use per day.	-10°C to +50°C	Up to 90% RH at 40°C	
4.	Quest * Electronics	M-6 Sound Hazard Integrator CA-10 Sound Level Calibrator.	0.709 kg	90 dBA to 115 dBA	An internal electronic latch is activated by short duration noise impulses above 115 dBA. Storage capacity: 0 to 999%.	ANSI S1.4-1971, Type S2A.	Ceramic omnidirectional microphone with collar clip attachment and 3 ft of cable.	Sound pressure levels at 85, 90, 95, 100, 105, 110, 115 and 117 dB at frequency 1000 Hz ± 3%.	18 V NCD-18 replacement Ni-Cd battery or additional battery charger C1825.	-10°C to +50°C		Leather tamper-proof security case, model CS-6. Additional battery charger model C-1825.

* The noise dosimeter, Model 60-520, Edmont, is made by Quest and is essentially their M-6. Quest have a second generation model ready to go, but are waiting for the new OSHA regulations to come out before releasing it.

The 166 Environmental Noise Classifier was used to evaluate noise exposure index. The instrument has wide application in industry, especially where irregular noise patterns require analysis.

3.3.1 Comparison of Effects of dBA Variation on Percentage Reading Between Seven New Noise Dosimeters

The value of the Noise Exposure Index was compared by seven Noise Dosimeters. The Noise Exposure Monitors were previously calibrated. During the calibration and reading of results only one GR-1944 Noise Exposure Indicator was used to eliminate the effects of variability between indicators. Pink Noise output wave forms, from a sine random generator, B and K, type 1027, were used for response measurements. Noise whose spectrum level decreases with increasing frequency to yield constant energy

per octave of bandwidth is called Pink Noise.

Test results and procedures are shown in Table 3.2. Monitor microphones were connected to the microphone of the sound level meter, B and K, type 2209. From the results it is evident that the noise dosimeter borrowed from Bruel and Kjaer has a low result at 90 dBA at "On" (long duration measurements), and also the noise dosimeter borrowed from Gen-Rad read zero at a noise level of 85 dBA. All the rest of the readings were within tolerance. The best data resulted with noise dosimeter, Model 60-520, Edmont (= Quest Electronics, M-6).

3.3.2 Noise Exposure Tests in the Mine

A full-shift noise exposure test was performed on the machines which produce the most noise in the mine.

The purpose of Table 3.3 is to show results of measurements with noise dosimeters and a noise classifier between the lockers and the beat area:

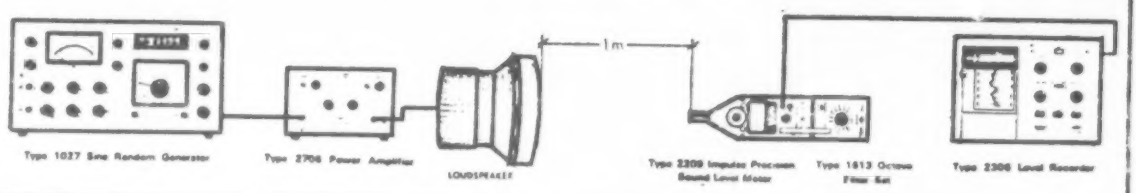
Staff An Environmental Engineer (No. 2) executed noise measurements, and because of it, became over exposed. The Safety Supervisor (No. 4) did not return the dosimeter on time and because of it no measurements were taken on the following day. In three cases the noise level exceeded 115 dBA.

Stoping In all cases the noise level exceeded 115 dBA. The precision of results depends upon the storage capacity of the instruments used. Because of this, results No. 12 and No. 14 do not have a real value. Instead they only have an information value.

The Stoper Miner (RB83) (No. 18) did not have an adequate evaluation.

TABLE 3.2

Comparison of Permissible Exposure Values in Percent between Seven Noise Dosimeters



No.	Level (dBA)	Time (min)	PERMISSIBLE EXPOSURE VALUES IN PER CENT						
			Expecting	Noise Dose Meter, Type 4425			Noise Dosimeter Gr-1944		Sound Dosimeter 40-520	D-100 Audio Dosimeter
				Property			Property		Property	Property
				Canmet*	Noranda	B and K	Canmet	Genrad	Edmont	Dupont
1	85	24	2.5	2	0	0	3	0	0	-
2	88	12	2	2.33	2	0.03	2	2	0	0
3	89	12	2.2	2.48	2.19	1.74	2	3	0.8	0
4	90	12	2.5	3	3.05	2.52	3	4	2.7	3
5	90	12	2.5	3	2	1	3	3	2.5	2.5
6	95	12	5	5.75	5.47	4.44	6	7	4.9	6
7	105	12	20	22.38	21.14	20.57	24	30	19	21

* The 4425/S changes the threshold from 90 dBA to 85 dBA, thus the 4425/S can be used for OSHA noise dose measurements using the current regulation (90 dBA cut-off) and proposed regulation (85 dBA cut-off).

** OSHA proposed regulation (85 dBA cut-off).

No.	Level (dBA)	Time (min)	PERCENT READING						
			Expecting	Noise Dose Meter, Type 4425			Noise Dosimeter Gr-1944		Sound Dosimeter 60-520	D-100 Audio Dosimeter
				Property			Property		Property	Property
				Canmet	Noranda	B and K	Canmet	Genrad	Edmont	Dupont
1	85	16	100	80	0	0	120	0	0	-
2	88	10.55	100	116.5	100	1.5	100	100	0	0
3	89	9.183	100	112.7	99.5	79.1	91	136	36.4	0
4	90	8	100	120	122	100.8	120	160	108	120
5	90	8	100	120	80	40	120	120	100	100
6	95	4	100	115	109.4	88.8	120	140	98	120
7	105	1	100	111.9	105.7	102.85	120	150	95	105

TABLE 3.3

Noise Exposure Index in Mine No. 12

No.	Job Category	Personnel Exposed	Exposure Index		Exceeded 115 dBA		Sampling Time (h)	Data	Instrument	Note
			Over Muff	Under Muff	Over Muff	Under Muff				
1	Captain	1	0.27		+			Nov. 05/75	Edmont	
2	Enur, Engineer	1	2.47		+			Nov. 10/75	Edmont	
3	Surveyor	1	0.08		+			Nov. 06/75	Edmont	
4	Safety Supervisor	1	0.03		-			Nov. 03/75	Du Pont	
	Total Staff	4								
5	Shift Boss	1	0.23		+			Oct. 29/75	B and K	2350 level
6	Shift Boss	1	0.51		+			Oct. 29/75	B and K	2350 level
7	Shift Boss	1	0.56		+			Oct. 29/75	Du Pont	2350 level
8	Shift Boss	1	0.11		+			Oct. 30/75	Du Pont	2350 level
9	Instructor, School Stope	1	3.50		+			Nov. 10/75	Gen Rad	
10	JR 300 Wills Wagon Operator	1	11.19	0.56	+	+		Nov. 10/75	B and K	1400 level, 54 HW N stope
11	630 Stope Jumbo Operator	1	29.44	2.19	+	+		Oct. 30/75	B and K	2350 level 1-N-XC
12	630 Stope Jumbo Operator	1	9.99		+			Nov. 07/75	Gen Rad	1900 level
13	630 Stope Jumbo Helper	1	1.16		+			Nov. 07/75	Gen Rad	1400 level only afternoon
14	Stoper (RB 83) Rockbolter Operator	1	9.99	1.33	+	+		Oct. 30/75	Gen Rad	2350 level, 5-IN stope
15	Stoper Rockbolter Driver	1	3.89		+			Nov. 12/75	Gen Rad	Only 4 h was used
16	Stoper Rockbolter Operator	1	4.21		+			Nov. 12/75	Gen Rad	Only 4 h was used
17	Jackleg Miner (JR 300)	1	15.72	1.67	+	+		Nov. 07/75	B and K	1900 level, No. 24
18	Stoper Miner (RB 83)	1	0.48		+		0.32*	Nov. 07/75	166 Class	1900 level
19	Jackleg Student Driller	1		1.82		+		Nov. 11/75	B and K	2350 level
20	Blaster	1	0.82		+			Nov. 11/75	Du Pont	
21	Blaster	1	0.35		+			Nov. 12/75	Du Pont	
22	Blaster	1	0.43		+			Nov. 12/75	Edmont	
23	Timberman	1	0.42		+			Nov. 03/75	Edmont	
	Total Stoping	19								

No.	Job Category	Personnel Exposed	Exposure Index		Exceeded 115 dBA		Sampling Time (h)	Data	Instrument	Note
			Over Muff	Under Muff	Over Muff	Under Muff				
24	Jumbo (ES 300) Operator	1	14.53	10.07	+	+		Oct. 28/75	B and K	2350 level
25	Jumbo (ES 300) Helper	1	0	4.09	0	+		Oct. 28/75	B and K	2350 level
26	Jumbo (ES 300) Operator	1	9.99	2.29	+	+		Oct. 31/75	Gen Rad	2350 level
27	Jumbo (J.C.) Operator	1	0.99		+		0.65**	Nov. 13/75	166 Class	2950 level
28	Diamond Driller Operator (VEC)	1	3.11	0.35				Oct. 31/75	B and K	2350 level
29	Diamond Driller Operator (VEC)	1	3.44	0.38	+	+		Nov. 04/75	Gen Rad	1900 level
30	Diamond Driller Operator (VEC)	1	3.67		+			Nov. 06/75	B and K	1900 level
31	Diamond Driller Helper (VEC)	1	2.90		+			Nov. 06/75	B and K	1900 level
32	Raise Miner	1	0.36		+			Nov. 11/75	B and K	No drilling done during the day.
33	Raise Miner	1	4.53		+			Nov. 13/75	Gen Rad	2800 level, V-3
34	Raise Bore Operator	2	2.31					Nov. 05/75	B and K	1900 level
35	Contractor New Shaft	1	1.21		+			Oct. 28/75	Du Pont	New Shaft, near fans
	Total Development	13								
36	MTT-420 Teletram Operator	1	1.92		+		3.67	Oct. 31/75	166 Class	2350 level
37	MTT-420 Teletram Operator	1	2.97		+		3.67	Oct. 31/75	Edmont	2350 level
38	MTT-420 Teletram Operator	1	1.33		+			Nov. 05/75	Gen Rad	1900 level
39	MTT-420 Teletram Operator	1	2.41		+			Nov. 06/75	Du Pont	1900 level
40	MTT-420 Teletram Operator	1	3.03		+			Nov. 06/75	Gen Rad	1900 level
41	ST4A Scooptram Operator	1	3.58	2.56	+	+	6.25	Oct. 29/75	Gen Rad	2350 Level
42	ST4A Scooptram Operator	1	0.32		+			Nov. 03/75	B and K	From 12.30 p.m. to 1.30 p.m. only
43	ST5A Scooptram Operator	1						Nov. 03/75	B and K	Cable
44	ST5A Scooptram Operator	1	3.15		+			Oct. 21/75	Du Pont	2350 level
45	ST8 Scooptram Operator	1	2.23	1.31	+	+		Nov. 11/75	Gen Rad	Operated a short period 1.5 to 2 h.
46	966 C Loader Operator	1	1.64		+			Nov. 05/75	Gen Rad	
47	966 C Loader Operator	1	0.81					Nov. 07/75	Du Pont	
48	D4D Bulldozer Operator	1	1.68					Nov. 04/75	Edmont	
49	D4D Bulldozer Operator	1	1.64					Nov. 07/75	Edmont	1900 level
50	Service Vehicle Operator	1	1.67					Nov. 05/75	Du Pont	
51	Hoistman	2	0.02		+			Oct. 30/75	Edmont	
52	Hoistman	2	0.03					Nov. 04/75	166 Class	
53	Skip tender	1	0.02		+			Nov. 11/75	Edmont	2950 level
54	Skip tender	1	1.17		+			Nov. 13/75		
55	Gage tender	1	.47		+			Nov. 13/75	Ger Rad	
	Total Haulage and Hoisting	22								

TABLE 3.3 (Cont.)

TABLE 3.3 (Cont.)

No.	Job Category	Personnel Exposed	Exposure Index		Exceeded 115 dBA		Sampling Time (h)	Data	Instrument	Note
			Over Muff	Under Muff	Over Muff	Under Muff				
56	Staging Area	M*	0.11				0.36	Nov. 03/75	166 Class	Total time = 8.345 h.
57	Sharpener, Bit Shop	1	1.57		+			Nov. 10/75	Du Pont	
58	Bit Shop	2	0.87		+		1.9	Nov. 11/75	166 Class	Total time = 8 h.
59	Machine Doctor	3	0.20		+		0.35	Nov. 12/75	166 Class	Total time = 8.2 h.
60	Garage	10	0.20		+			Oct. 28/75	Edmont	2350 Garage (100' x 50' x 40')
61	Garage	10	0.23					Oct. 29/75	Edmont	2350 Garage (150' x 50' x 40')
62	Garage	13	0.35				1.4	Nov. 05/75	166 Class	1900 level Total time = 7.0 h.
63	Garage	13	0.56				1.87	Nov. 06/75	166 Class	1900 level Total time = 7.38 h.
64	Garage	9	0.13				0.38	Nov. 10/75	166 Class	1400 level Total time = 5.83 h.
65	Crusher Helper	1	2.99		+			Nov. 13/75		2950 level
66	Mechanic	1	9.99		+			Nov. 03/75	Gen Rad	
67	Mechanic	1	2.76		+			Nov. 03/75	Gen Rad	
68	Mechanic	1	0.03					Nov. 04/75	B and K	1400 level
69	Mechanic	1	10.37		+			Nov. 04/75	B and K	2350 level
70	Electrician	1	1.16		+			Nov. 10/75	Gen Rad	
	Total Crew	M+67								

* Sampling time over 115 dBA: 115-117 dBA is 0.2 h and >117 dBA is 1.03 h

** Sampling time over 115 dBA: 115-117 dBA is 0.42 h and >117 dBA is 1.6 h

* Large number of miners.

Noise Exposure Index in Mine No. 12

Sampling time which is over 115 dBA amounts to 1.23 hours. These measurements were performed with a 166 Noise Classifier. The attenuation of ear muffs was good in one case only (No. 10). During surveying it was observed that the operator of IR 300 Wills Wagon (No. 10) operated the machine skillfullywhile at the same time taking time out to readjust his muffs.

Development The results of measurements on Jumbo Machines cannot be compared (No. 24, 25, 26 and 27). The noise dosimeter showed no values during testing of the Jumbo helper (No. 25). The reasons for this are unknown. The situation again occurred in which the results were dependent on the storage capacity of the instrument, here 999% (No. 26). Jumbo Operator (No. 27) was tested with a 166 Noise Classifier and had 2.02 hours of sampling time which was over 115 dBA.

The attenuation of the muffs was very poor, especially around the operator of a Jumbo IS 300 (No. 24). This worker had no time to adjust his muffs. Other than that, his muffs were old and frail.

Measurement results between diamond drilling operators showed many similarities (No. 28, 29 and 30). The attenuation of new muffs was very good because the drillers had time to adjust them. Diamond drillers operated their machines with skill.

Haulage and Hoisting Measurement results varied between each other when the same type of vehicles were used for similar work purposes. An ST4A Scooptram Operator (No. 41) was tested on the same day with GR-1944 noise dosimeters, (over muff and under muff). Other than that,

a 166 Noise Classifier microphone was attached near the operator's head (Appendix 3.1). The 166 Noise Classifier showed an exposure index of 5.65, but the GR-1944 noise dosimeter showed 3.58. The equivalent continuous sound level evaluated on the basis of the classifier is 104 dBA, and on the basis of the dosimeter it is 101 dBA. Now there are reasons to ask which result is the correct one. On the basis of measurements performed on the ST4A Scooptram (Table 4.2, Table 4.5, and Table 4.6) it was found that the result obtained with a 166 Noise Classifier is more accurate.

We are presently observing five results from the MTT-420 Teletram Operators, which are in Table 3.3:

No.	Exposure Index	Sampling Time	L_{eq}	Note
36	1.96	3.67	100.4	MTT-420 Teletram
37	2.97	3.67	103.7	Operator, Oct. 31/75
38	1.33	-	-	
39	2.41	-	-	
40	3.03	-	-	
R.M.S.	2.43			

The equivalent continuous sound level (L_{eq}) of the noise classifier differs from the noise dosimeter by 3.3 dBA. Two different instruments under similar environmental conditions gave two different results. Both results were within the tolerance limit for Type 2 Sound Level Meters. From this it is evident that measuring exposure index per haulage cycles or miles is better (11). On the basis of these measurements an evaluation of exposure index per shift can be performed easily.

Crew Tests showed that the bit sharpener (No. 57) in the bit shop and a crusher helper (No. 65) have an exposure index which is more than one. In the bit shop (No. 58) the noise exposure index is almost one and L_{eq} = 99 dBA. In the "machine doctor" room the noise exposure index is low, but L_{eq} (101 dBA) is high during sampling periods. Test results obtained from the mechanics (No. 66 and 67) were unreal. It was learned that they placed their microphones directly on the motor of the Scooptram so that the readings would be higher. Otherwise the results from all the mechanics (No. 68) would have been similar to that of No. 68.

In the garage a high level of noise is experienced only upon the departure or arrival of vehicles. At all other times the sound level is less than 60 dBA. On the staging area the exposure index is less than 1. Noise durations are 22 minutes with L_{eq} = 96.2 dBA. At other times the noise level in the staging area was always less than 90 dBA.

3.4 Statistical Sampling Techniques

The accuracy of personal noise monitoring, using a dosimeter, is a function of the statistical sampling. D.O. Conn III described a method for determining the number of days and number of instruments that is required to obtain valid results (12). The method has no practical application, because there is insufficient information available to make accurate estimates of the standard deviation of measurement of the instrument (σ_i), and the standard deviation of the work environment in decibels (σ_w). Several dosimeters can be used for several days to obtain

data which can be analyzed for σ_i and σ_w through statistics. It is quite evident that the need for sampling standards ranks equally with noise dosimeter performance ANSI SI. 4.1971 for Type 2 Sound Level Meter.

The statistical method requires a large number of instruments. It also requires a technician who will watch the instruments during sampling periods, take readings and make calibrations, and finally to clean up. Several instruments must be kept in reserve, in case of a breakdown, because these particular instruments are only repaired by factory service.

4. NOISE LEVELS OF DIESEL POWERED UNDERGROUND MINING EQUIPMENT

To evaluate vehicle operator exposure to noise, we need to know the noise levels generated by diesel powered underground mining equipment. The major influences on the operator underground are his location with respect to the engine. In terms of operator noise exposure, ranking of the noisiest machines starts with load-haul dump machines, followed by bulldozers, service trucks, tractors, etc.

From our field surveys and interviews with mine staff, we estimated that one third of all miners are exposed to the noise from diesel-powered machines, including operators and bystanders.

4.1 Noise Levels and Engine Types - Near Field Test

Basic analysis of the haulage equipment was performed. Readings were taken near the operator's ear, at idle and at wide open throttle (W.O.T.) Table 4.1. Readings were made on one of each type of vehicle and readings

TABLE 4.1

No.	Vehicle Type and Manufacturer	Engine Type	hp	No. Cylinders	Background noise (dBA)	At Operators Ear (dBA)		A 1m from Exhaust (dBA)		Notes
						Idle	W.O.T*	Idle	W.O.T*	
1	MTT-420 Teletram Wagner (VH 114)	Deutz Diesel	175	8	68	86	100	90	105	1775-1900 level. Nov. 06/75
2	MTT-420 Teletram Wagner (VH 115)	Deutz Diesel	175	8	66	84	99	90	104	1775-1900 level. Nov. 06/75
3	MTT-420 Teletram Wagner (VH 117)	Deutz Diesel	175	8	72	85	103	87	106	1775-1900 level. Nov. 06/75
4	ST5A Scooptram Wagner (VLO 49)	Deutz Diesel	175	8	74	86	101	89	106	1775-1900 level. Nov. 06/75
5	ST5A Scooptram Wagner (VLO 60)	Deutz Diesel	175	8	78	82	97	87	103	1250 level, 50 Stope, 12 x 50 Nov. 11/75.
6	ST4A Scooptram Wagner (VLO 43)	Deutz Diesel	145	6	65	84	107	89	109	1775-1900 level. Nov. 06/75
7	ST4A Scooptram Wagner (VLO 39)	Deutz Diesel	145	6	64	87	104	93	110	1775-1900 level. Nov. 06/75
8	ST4A Scooptram Wagner (VLO 37)	Deutz Diesel	145	6	74	88	102	89	107	1775-1900 level. Nov. 06/75
9	ST4A Scooptram Wagner (VLO 36)	Deutz Diesel	145	6	74	89	106	93	109	1775-1900 level. Nov. 06/75
10	ST4A Scooptram Wagner (VLO 26)	Deutz Diesel	145	6	79	88	109	91	110	1250 level. Nov. 11/75
11	ST4A Scooptram Wagner (VLO 27)	Deutz Diesel	145	6	75	90	104	92	107	1250 level No. SUB, 9x13, Nov 11/75
12	ST4A Scooptram Wagner (VLO 29)	Deutz Diesel	145	6	69	90	103	85	108	1250 level, 44 Stope, 12 x 60 Nov. 11/75.
13	ST4A Scooptram Wagner (VLO 31)	Deutz Diesel	145	6	82	89	105	90	109	1250 level, No. 6 SUB, 9 x 13 Nov. 11/75.
14	ST2B Scooptram Wagner	Deutz Diesel	78	4	68	88	98	94	103	1775-1900 level, Nov. 06/75
15	966C Loader Caterpillar (VL 104)	Caterpillar Tractor	130	8	66	77	99	83	102	1775-1900 level, Nov. 06/75
16	966C Loader Caterpillar (VL 104)	Caterpillar Tractor	130	8	70	82	99	88	106	1775-1900 level. Nov. 06/75
17	D4D Bulldozer Caterpillar	Caterpillar Tractor	56	4	64	87	99	88	101	1775-1900 level. Nov. 06/75
18	D4D Bulldozer Caterpillar	Caterpillar Tractor	56	4	73	91	98	89	99	1250 level. No. 4 SUB, 9 x 13, Nov. 11/75
19	Monashee-Wagner (VPO 526)	Deutz Diesel	52	4	67	87	101	93	108	1775-1900 level. Nov. 06/75
20	Service Truck Wagner (VPO 523)	Deutz Diesel	52	4	74	88	99	91	105	1775-1900 level. Nov. 06/75
21	Service Truck Wagner	Deutz Diesel	52	4	54	81	99	86	103	1775-1900 level. Nov. 06/75
22	Service Vehicle Wagner (JUT 43)	Deutz Diesel	52	4	79	88	96	88	96	1250 level. No. 4 SUB, 9 x 13, Nov. 11/75
23	Mechanics Service Tractor (OMM 22)	Deutz Diesel	52	4	81	85	95	93	103	1250 level. 50 NW, 12 x 30, Nov. 11/75
24	Service Farm Tractor Massey-Ferguson. (VTO 12)	Massey-Ferguson	-	4	79	86	99	89	102	1250 level. Tool Crib, 9 x 13, Nov. 11/75
25	Girraff Atlas Copco (VP 531)	--	-	4	66	84	100	84	100	1250 level, 52 Stope, 12 x 30, Nov. 11/75
26	Development Jumbo Wagner (DJ 081)	Deutz Diesel	52	6	72	90	96**	95	100	1775-1900 level. Nov. 06/75
27	Development Jumbo Wagner (DJ 083)	Deutz Diesel	52	6	88	89	99	91	103	1250 level, No. 6 SUB, 9 x 13, Nov. 11/75
28	Development Jumbo Wagner (DJ 085)	Deutz Diesel	52	6	72	88	99	88	101	1775-1900 level. Nov. 06/75

Note: * Wide Open Throttle.

** Can't Open Full.

on other vehicles could vary. Noise on grades is high. We have made measurements at 1 meter from the exhaust to estimate noise levels to which workers other than the machine operator would be exposed. A comparison of results is very difficult to make, because the absorption coefficients (α) differ. By reason of this, the measurement results from Table 4.1 are categorized according to the horsepower of the vehicles.

Table 4.2 shows the correlation of horsepower with average sound pressure levels from Table 4.1 at the operator's ear and at the exhaust.

TABLE 4.2

Noise from Diesel-Powered Machines in Relation to Horsepower

hp	No. of Samples	Total %	dBA*			
			At Operator' Ear		At 1m from Exhaust	
			Idle	W. O. T.	Idle	W. O. T.
175	5	19.2	84.83	100.45	88.80	104.95
145	8	30.8	88.45	105.55	90.85	108.76
130	2	7.9	80.19	99	81.76	104.44
78	1	3.8	88	98	94	103
56	2	7.9	89.44	98.53	88.53	100.11
52	8	30.8	87.60	98.40	91.51	103.55
Σ	26	100.4				

* Average: $\overline{SPL} = 10 \log \frac{1}{n} \left(\text{antilog} \frac{SPL_1}{10} + \text{antilog} \frac{SPL_2}{10} + \text{---} + \text{antilog} \frac{SPL_n}{10}\right)$

The 145 hp engines emitted higher noise levels in comparison to other diesel-powered machines. The major influences on noise levels are: location of engines, mass of vehicles, condition of exhaust mufflers etc. It is impossible to interpret properly many of the reported levels in

Table 4.1. Noise levels, at the operator's position, from data listed in Table 4.2 were compared with two complete measurements during a shift with the B and K 166 Environmental Noise Classifier:

	E.I	Sampling time (h)	L_{eq}	Average W.O.T.	Note
MTT-420 Teletram Wagner*	1.92	3.67	100.2	100.45	175 hp
ST4A Scooptram Wagner+	5.65	5.64	105.2	105.55	145 hp

* From Table 3.3 (No. 36)
+ From Appendix 3.1

The equivalent continuous sound level in both examples is equal to W.O.T. for equal engine horsepowers. If a large number of measurements prove this assumption, it will be simple to measure noise levels and to estimate the exposure index.

The noise levels at the operator's position are higher underground because of the acoustic characteristics of the underground mining environment. Usually we take into account that the increase of tunnel noise is equal to 3 dB (reverberant field). Near-field tests were also done by measuring the octave band data of the exhaust 3 feet from the side. Figure 4.1 shows a comparison of near-field exhaust noise data, and data at the operator's station. This method has an advantage because it indicates muffler performance with much less influence from the noise around the operator's station. The test shows the characteristic spectra of the exhaust noise, which is similar in shape to that measured at the operator's station. The noise energy has dominant frequencies above 500 Hz and has a greater potential for causing hearing loss

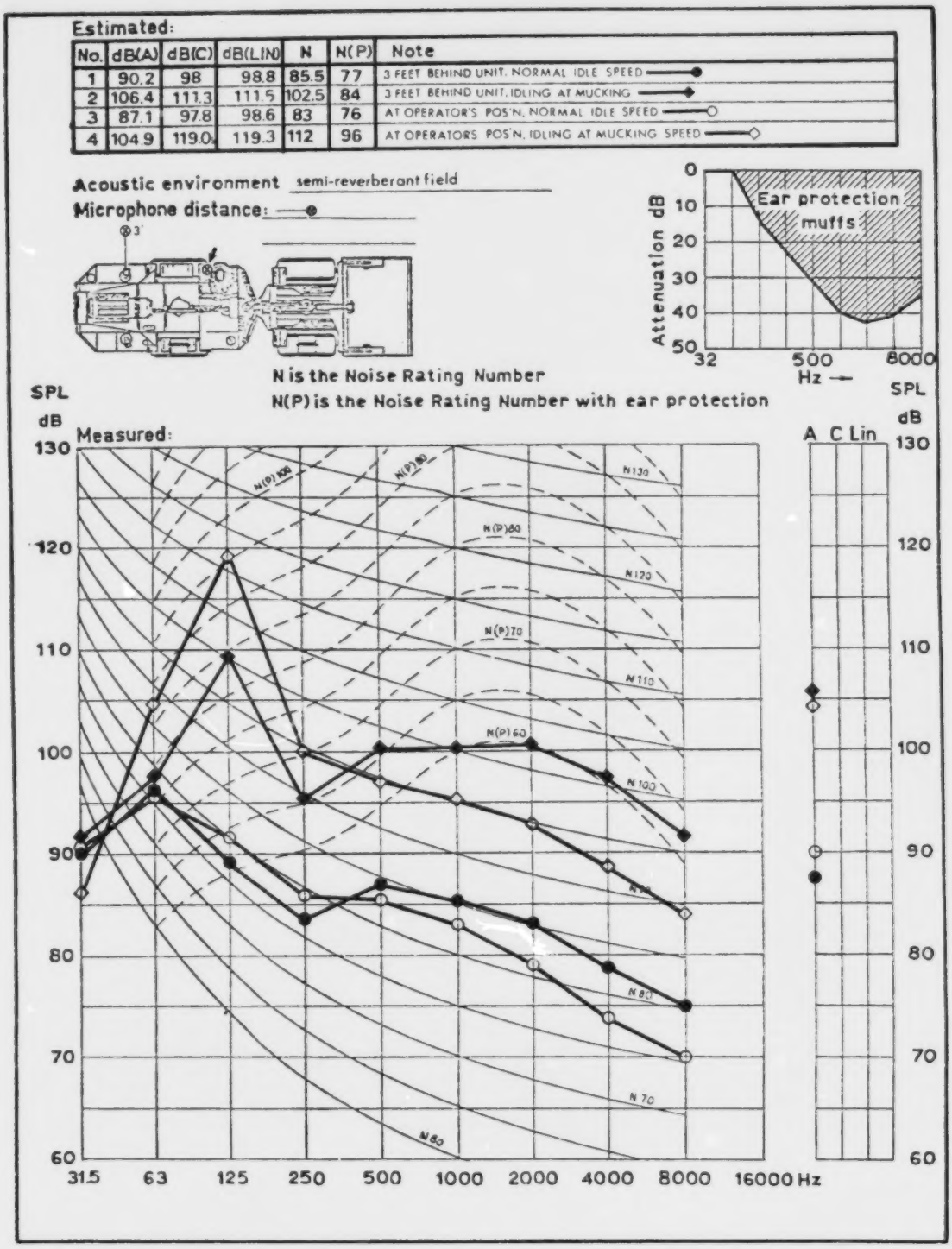


Figure 4.1: Comparison of Near-Field Exhaust Octave Band Noise Data, and Data at the Operator's Station on ST4A Scooptram (VL 042).

than noise energy concentrated in the low-frequency area.

The near-field test is a simple and quick way to provide information and to apply a systematic approach to noise control. However, it is not accurate enough to identify the relative contribution of the source.

4.2 Methods of Measurement of Noise Emitted by Underground Vehicles

At the present time, a standard method for measuring the noise levels of a moving vehicle does not yet exist. These tests were designed to characterize the noise environment in relation to the bystander.

The mine walls and roof reflect back to a bystander noise energy that would otherwise be lost to the atmosphere (Figure 4.2). How much

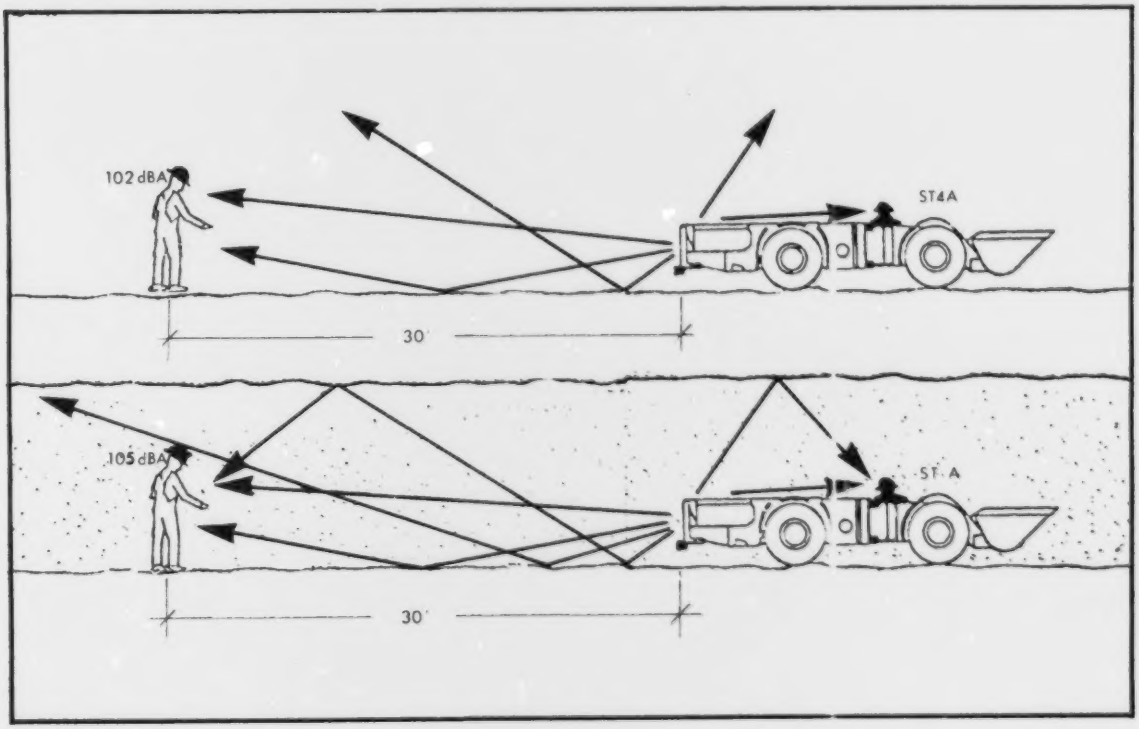


Figure 4.2: Noise Levels in a Tunnel can be 2 to 3 dBA greater than Aboveground Levels for the ST4A Scooptram Wagner.

is reflected from the walls and roof is a function of the tunnel geometry and type of stone, as well as of the size of the equipment.

ISO* Recommendation R. 362 is based on a moving aboveground vehicle test. However, because of different practices underground and aboveground, specification for underground tests should be made.

For measurements underground it is recommended to use a sound level meter Type 2 with the A scale weighting network. A suitable acoustical environment for the test would consist of a tunnel, of which the central 60 feet (20 m) has a microphone with sound level meter.

The background noise should be such that the reading produced on the meter is at least 10 dB below that produced by the test vehicle. In Tables 4.3, 4.4, 4.5, and 4.6 measurement results are given, under different environmental conditions and similar types of vehicles. The measurement results showed the following:

1) Loaded vehicles made more noise than unloaded vehicles.
2) Vehicles of the same power and series, under similar and unsimilar conditions emit different noise levels.
3) Different vehicles with the same amount of horsepower, emit different noise levels.
4) Between results of noise levels in Tables 4.3, 4.4, 4.5 and 4.6 and Table 4.1 there are no coincidences.

On the basis of the results obtained it can be concluded that there is much difficulty in predicting and comparing all environmental factors which influence the variable results.

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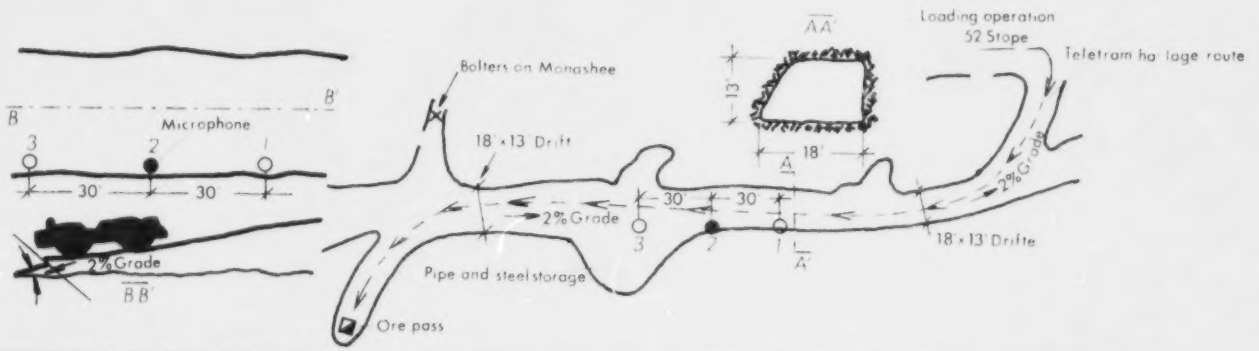
* International Organization for Standardization

TABLE 4.3

Noise Levels of a Moving Vehicle on 1900 Level, W.O.Z. No. 1 SUB



No.	Vehicle Type and Manufacturer	Background Noise (dBA)	No. of Samples	Loaded									Unloaded									No. of Samples
				1 dBA			2 dBA			3 dBA			1 dBA			2 dBA			3 dBA			
				$\overline{SPL}$*	M×	SD+	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	
1	MTT-420 Teletram Wagner	58	9	96.7	46.5	0.3	103	102.9	0.3	98.1	98	0.3	97.4	97.3	0.3	104.7	104.7	0.3	98	97.8	0.2	9
2	Monashee Wagner	58	1	96			99			96			90.8	90.7		97.1	96.7		93	92.3		3
3	ST4A Scooptram Wagner	58	-										101			108			104			1
4	966C Loader Caterpillar	58	-										96			99			94			1
5	Service Vehicle	58	-										97			102			95			1
6	MTT-420 Teletram Wagner	54	1	{100			{103			{101			98			103			100			1
7	Service Truck Wagner (VP 521)	54	1	99}			100}			100}			95			100			96			1
8	MTT-420 Teletram Wagner	54	3	98.4	98.3		105	105		100.5	100.3		93			96			94			1
9	966C Loader Caterpillar	54	2	95	95		100.2	99.5		95	95.1		99			103			101			1

Note: * Average $\overline{SPL} = 10 \log \frac{1}{n} (\text{antilog} \frac{SPL_1}{10} + \text{antilog} \frac{SPL_2}{10} + \text{--------} + \text{antilog} \frac{SPL_n}{10})$

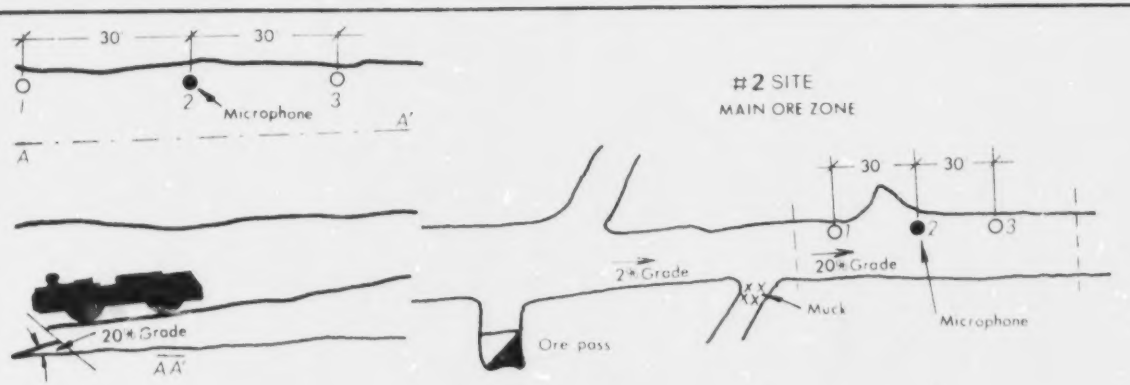
× Mean

+ Standard Deviation

{ } Teletram behing Service Truck

TABLE 4.4

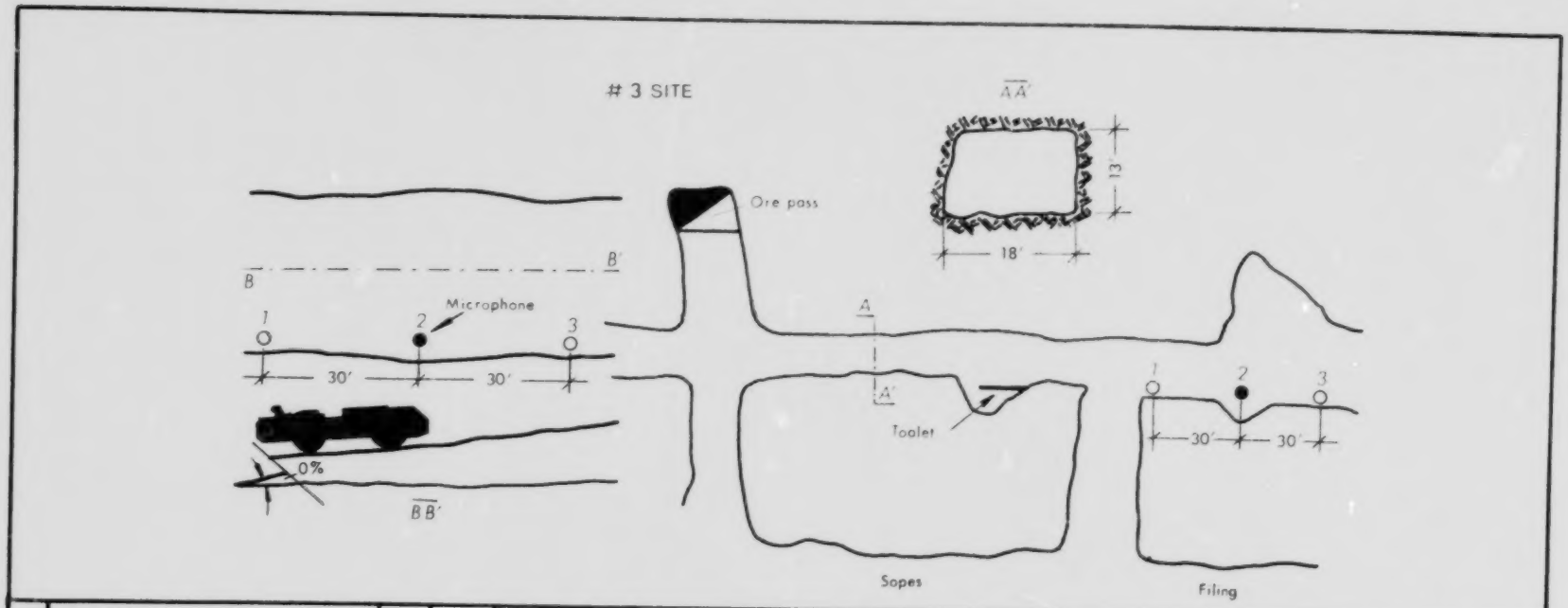
Noise Levels of a Moving Vehicle on 1900 Level, W. O. Z. No. 3 SUB



No.	Vehicle Type and Manufacturer	Background Noise (dBA)	No. of Samplies	Loaded									Unloaded									No. of Samples
				1 dBA			2 dBA			3 dBA			1 dBA			2 dBA			3 dBA			
				$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	$\overline{SPL}$	M	SD	
1	MTI-420 Teletram Wagner	70	13	99.4	99.4	0.2	102.6	102.4	0.4	97	97.3	0.5	93.8	93.8	0.2	97.4	97.1	0.5	95.6	95.2	0.4	13
2	Service Vehicle Wagner	68.4	2	99.4	99		103.7	103.5		97.1	97											-
3	Mechanic's Service Tractor (MM 22)	69	1	90			92			87			83			85			84			1
4	Monashee Wagner	69	1	100			106			103												-

TABLE 4.5

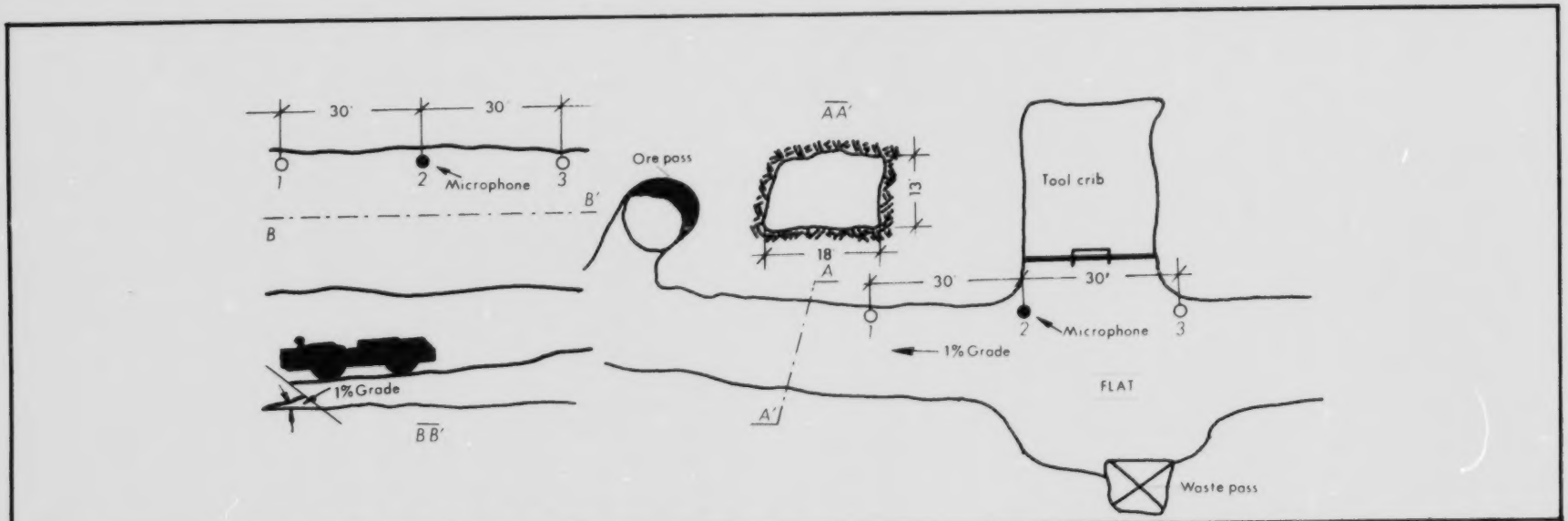
Noise Levels of a Moving Vehicle on 1900 Level, W.O.Z. No. 3 SUB



No.	Vehicle Type and Manufacturer	Background Noise (dBA)	No. of Samples	Loaded									Unloaded									No. of Samples
				1 dBA			2 dBA			3 dBA			1 dBA			2 dBA			3 dBA			
				SPL	M	SD	SPL	M	SD	SPL	M	SD	SPL	M	SD	SPL	M	SD	SPL	M	SD	
1	MTT-420 Teletram Wagner	78											97			103			100			1
2	ST4A Scooptram Wagner	81.2	3	102.1	102		106	106		102.2	102		101.4	100.7		105.5	105.5		101.8	102		4
3	D4D Bulldozer Caterpillar	70	1	93			98			92												
4	Service Vehicle Wagner	72											97			102			99			1

TABLE 4.6

Noise Levels of a Moving Vehicle on 2107 Level



No.	Vehicle Type and Manufacturer	Background Noise (dBA)	No. of Samples	Loaded									Unloaded									No. of Samples
				1 dBA			2 dBA			3 dBA			1 dBA			2 dBA			3 dBA			
				SPL	M	SD	SPL	M	SD	SPL	M	SD	SPL	M	SD	SPL	M	SD	SPL	M	SD	
1	ST4A Scooptram Wagner	73.9	41	101.65	101.3	0.27	107.9	107.7	0.19	105.2	105	0.2	101.3	101	0.26	107.4	107.1	0.23	105.4	105.2	0.2	41
2	ST5A Scooptram Wagner	73.5	-										101.5			104			103			2
3	Monashee Wagner	80.5	1	89			96			93			-			96.5			94.5			2
4	Mechanic's Service Tractor	80	-										92			97.5			95.5			2

The effect of cumulative exposure on the bystander is more difficult to assess. If we assume that these bystanders are mostly production workers, then their noise levels are, during shifts, from 90 dBA to 117 dBA. In this case the dosimeter is the best device for measuring noise.

A final problem to be considered in assessing noise is the partial observation with summary exposure involving different machines. One good example is the front-end loader.

The front-end loader was engaged in loading the MTT-420 Teletram at beat area. The teletrams came at irregular intervals and waiting periods were sometimes extended. During the time between teletrams, the operator engaged in cleaning up the landing. The noise level at the operator's ear does not vary appreciably from one loading cycle to another. For all operations the sound levels were between 90 and 102 dBA with three minima of noise up to 90 dBA (Table 4.7). Noise exposure is calculated from each teletram loading. At 12.5 teletram loads (1 load = 4.5 buckets) the noise exposure index exceeds 1. The equivalent continuous sound level is 96.6 dBA (graphical method).

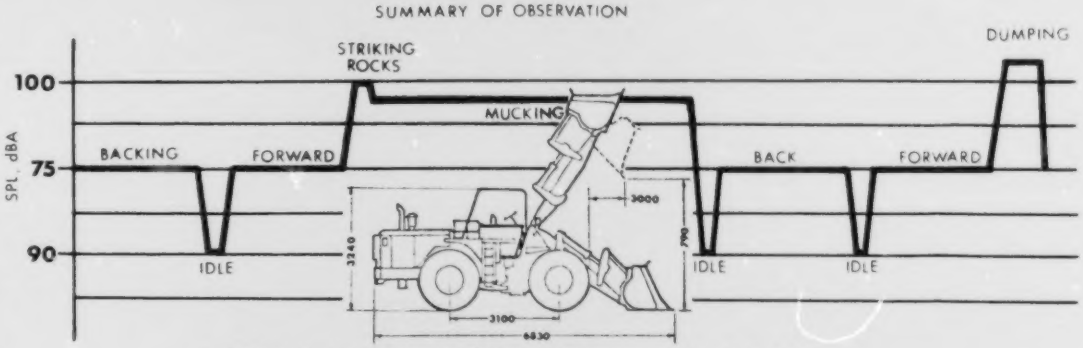
4.3 Noise Exposure of Operators and Machines Responsible for the Noise

The most used machines are the load-haul-dump (LHD) vehicles. For the most part the vehicles used for underground mining operations are powered by engines with more than 130 hp. The machine, as a source, does not produce a continuous noise. The noise varies from one day to the next and therefore from one site to the next. The operators are exposed to these variable sound sources.

TABLE 4.7

Noise of Front End Loader 466C, 2350 Level

SUMMARY OF OBSERVATION



BUCKET LOADING CYCLE – AVERAGE TELETRAM LOAD IS 4.5 BUCKETS

OPERATION	SPL	AVERAGE TIME PER BUCKET CYCLE	AVERAGE TIME PER TRUCK LOAD	
			SECONDS	HOURS
IDLE	90	1.5	6.75	.0125
IDLE BETWEEN TRUCKS	90	8.49	38.2	
DRIVING	95	19	85.5	.0238
MUCKING	98	14	63	.0175
STRIKING ROCK	100	1	4.5	.0013
DUMPING	102	1	4.5	.0013

NOTE: EXPOSURE IS CALCULATED FOR EACH TELETRAM EQUAL TO AN AVERAGE OF 4.5 BUCKETS. MULTIPLY TOTAL BY NUMBER OF DAILY LOADS TO OBTAIN DAILY EXPOSURE

dBA MAX LEVEL	EXPOSURE TIME If necessary, note time of day	C TOTAL DURATION IN HOURS PER DAY	T PERMISSIBLE HOURS PER DAY	C/T
102	.0013	.0013	1½	0008
100	.0013 + .0175	.0188	2	0094
97			3	
95	.0239	0239	4	0060
92			6	
90	0125	0125	8	0016
			TOTAL	0178

RECOMMENDATIONS: EAR PROTECTION IS REQUIRED IF THE NUMBER OF DAILY TELETRAM LOADS EXCEEDS 56

SIGNED: Alcan Smith

In order to illustrate the effects of noise exposure index of different machines, Table 4.8 was completed.

TABLE 4.8

Permitted Duration of Noise at Different Vehicles

No.	Vehicle Type and Manufacturer	L_{eq}* (dBA)	Exposure Limits(h)		Note
			Without Ear Muff	With Ear Muff	
1	MTT-420 Teletram Wagner	100.5	1.87	No limit	175 hp
2	ST5A Scooptram Wagner	100.5	1.87	No limit	175 hp
3	ST4A Scooptram Wagner	105.6	0.92	No limit	145 hp
4	ST2B Scooptram Wagner	98	2.63	No limit	78 hp
5	966C Loader Caterpillar	99	2.3	No limit	130 hp
6	D4D Bulldozer Caterpillar	98.5	2.47	No limit	56 hp
7	Monashee - Wagner	98.6	2.43	No limit	52 hp
8	Service Truck-Wagner	98.6	2.43	No limit	52 hp
9	Development Jumbo-Wagner	98.6	2.43	No limit	52 hp

*Note: L_{eq} = Mean of noise from Diesel-Powered machines in relation to horsepower (see Table 4.1 and Table 4.2).

The results of the noise exposure limits for a normal 8 hour working day show that the workers must wear hearing protectors.

5. NOISE CONTROL IN VENTILATION SYSTEMS

The fans in underground mines emit noise levels that are potentially harmful. They are usually situated in places of communication and have no significant influence on the miner's exposure to noise.

5.1 Field Tests or Acceptance Tests

One of the most important parts of this whole procedure would be a standardized acceptance test for fans. Unfortunately at the present time there is no accepted procedure for evaluating an acoustical system underground. Work is being done on this problem but proposals are not in final form at the present time.

However, it is practical to check the acoustic properties of an installed system within reasonable limits. This is a difficult thing to work into a standardized procedure or specification, but at the present time there seems to be no alternative since experienced judgement is required in work of this kind.

One recommendation would be to utilize a sound power source of known and calibrated sound power level (13). The system would be shut down and this reference sound source operated in the area to be evaluated. Sound pressure levels taken from the reference sound source will establish the acoustic environment for the test. The system can then be operated and sound pressure levels undertaken under these conditions. With this data the sound power level of the system can be calculated. In this way it may be determined whether the actual sound power level meets the

specified sound power level and whether or not the room characteristics were as originally specified.

The second recommendation is based on using octave band sound pressure level readings to calculate the sound power level (two-surface method). The machinery must be tested in semireverberant locations, corrections can be made to the calculated sound power level of each band to determine the approximate free-field sound power levels (14).

It does not appear to be practical to establish a standard set of conditions for this type of test since so many field variations are possible. The method of evaluating the sound power generated by the fan is well established and specified by the AMCA* Test Code for Sound Rating (300-67) and from an ASHRAE** Standard (36-62). The conditions for a specific test could be made a part of the specifications. This is still far from being a specification that permits a completely routine compliance check, but it must be remembered that one of the initial conditions laid down herein was that the persons participating in this work must have acoustic experience. If this is the case, the suggested procedure is practical.

The real problem in any technique is to establish the average sound pressure level value. If a person has had experience with field measurements, he is only too familiar with the sound pressure fluctuations that occur,

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* Air Moving and Conditioning Association.

** American Society of Heating, Refrigerating and Air-Conditioning Engineers.

recognizing this to be part of the problem.

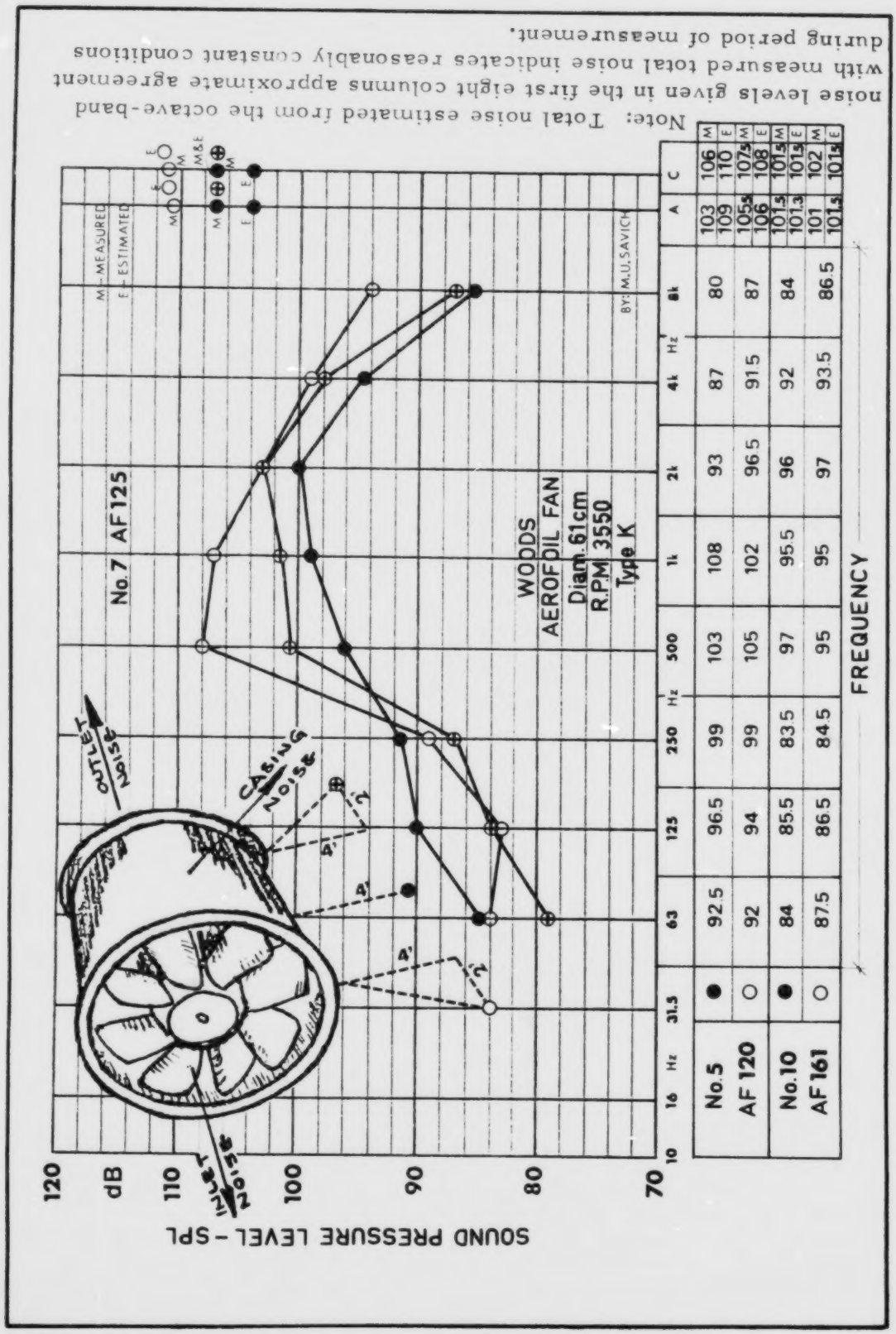
Sound pressure level data must be taken with a graphic level recorder rather than by observing a hand meter. The graphic level record puts the data in a permanent form that permits subsequent examination by interested persons. It also shows the degree of fluctuation of sound pressure level, which is not indicated when the observer records his estimate as a single number.

5.2 Comparison of the Predicted Results with Measured Results.

The fan, like every machine, is a source of sound power level. The sound power level generated by the source is constant but the amount of noise being received by each listener is different. However, the listener is subjected to a sound pressure level which is a result of the combination of the original sound power level and the neighbouring acoustical environment.

Noise is generated by the fan wheel and is radiated from the fan wheel through the fan outlet, the fan inlet, and to some extent through the fan casing (Figure 5.1). The amount of noise radiated through the fan inlet is approximately equal to the amount of noise radiated through the fan outlet. The amount of noise radiated through the casing is not evaluated by the present code and is difficult to estimate due to differences in fan housing construction. However, it is possible to get some estimate of this noise component.

In Figure 5.1 for equivalent sound pressure levels, casing noise was observed by a hand meter, which is usually used in practical surveying of noise. The measured results in the dBA scale for casing noise and outlet



		10 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	A	C	
No.5 AF 120	●				92.5	96.5	99	103	108	93	87	80	103	106	M
	○				92	94	99	105	102	96.5	91.5	87	109	110	E
													105.5	107.5	M
													106	108	E
No.10 AF 161	●				84	85.5	83.5	97	95.5	96	92	84	101.5	101.5	M
													101.3	101.5	E
	○				87.5	86.5	84.5	95	95	97	93.5	86.5	101	102	M
													101.5	101.5	E

Figure 5.1: Sound Pressure Level of Noise from Casing of Axial-Flow Fan by Observing a Hand Meter

noise are approximately equal. The casing noise will be approximately the average of the equivalent sound pressure level.

In all cases the sound sources underground have a finite size and radiate different amounts of acoustic power in different directions. The basic power formula which relates the sound pressure level outdoors to the sound power level is given as (15):

$$SPL = PWL + 10 \log \frac{Q}{4\pi r^2} + 10.5 \text{ dB} \quad \text{---------- Eq. (5.1)}$$

where: SPL = sound pressure level, dB re 0.0002 μ bar,

PWL = sound power level, dB re 10^{-12} W,

r = distance in feet from the source, and

Q = directivity factor of the source.

Reflecting surfaces increase the sound pressure level, since the power is directed toward a particular location. The directivity factor for uniform radiation over $\frac{1}{2}$ of sphere is 2.

The general equation, Eq. (5.1), for sound propagation can be modified to account for the effects of interior surfaces (15):

$$SPL = PWL + 10 \log \frac{Q}{4\pi r^2} + \frac{4}{R} + 10.5 \text{ dB} \quad \text{------Eq. (5.2)}$$

Comparing this to Eq. (5.1) the addition of the term $\frac{4}{R}$ will be noticed.

The room constant, R, is defined as (Figure 5.2).

$$R = \frac{S\bar{\alpha}}{1-\bar{\alpha}} \quad \text{---------- Eq. (5.3)}$$

where: S = total area of the walls, ceiling, and floor in feet, and

$\bar{\alpha}$ = average sound absorption coefficient.

The sound absorption coefficient, α, represents the ratio of the sound incident on materials, and varies from 0 to 1.

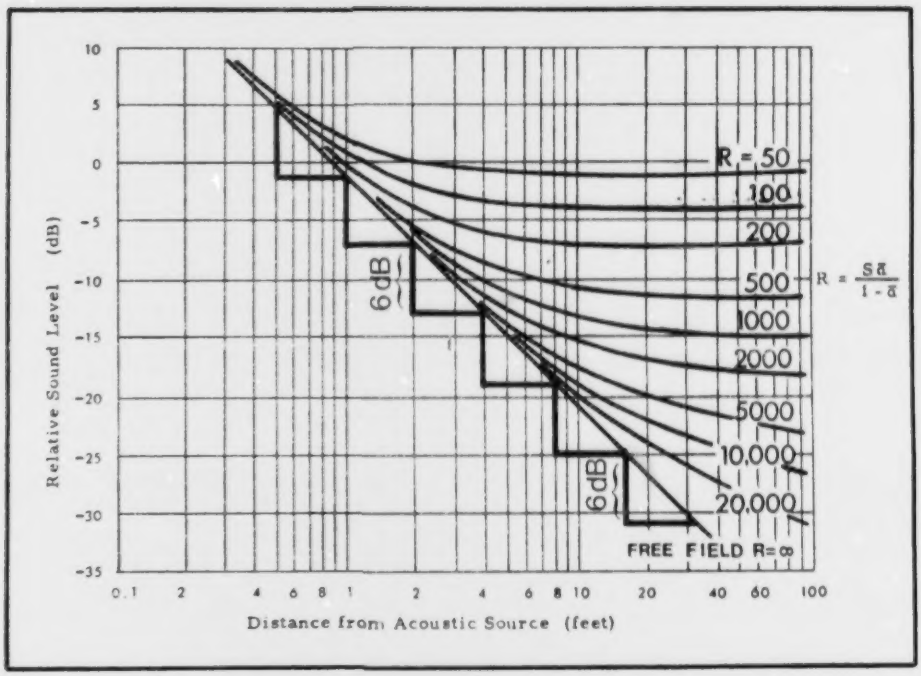


Figure 5.2: Calculating Reverberant Field Decay (Room Constant, R).

It can be seen that when α is small, i.e., the room surfaces are highly reflective, R is also small. When R = 50 the sound pressure is fairly constant at any position from the source (Figure 5.2).

Equation 5.2 can be expressed now:

$$SPL = PWL - 9.5\ dB \quad \text{---------- Eq. (5.4)}$$

or, approximately, $SPL = PWL - 10\ dB$ -------- Eq. (5.5)

The noise output of a fan can be estimated within close limits when the static pressure is known, and either the driving-motor horsepower or the delivered air volume per minute is given (Figure 5.3 to 5.8)(17, 18, 19). The over-all sound-power level of fans can be determined from the following equations (15):

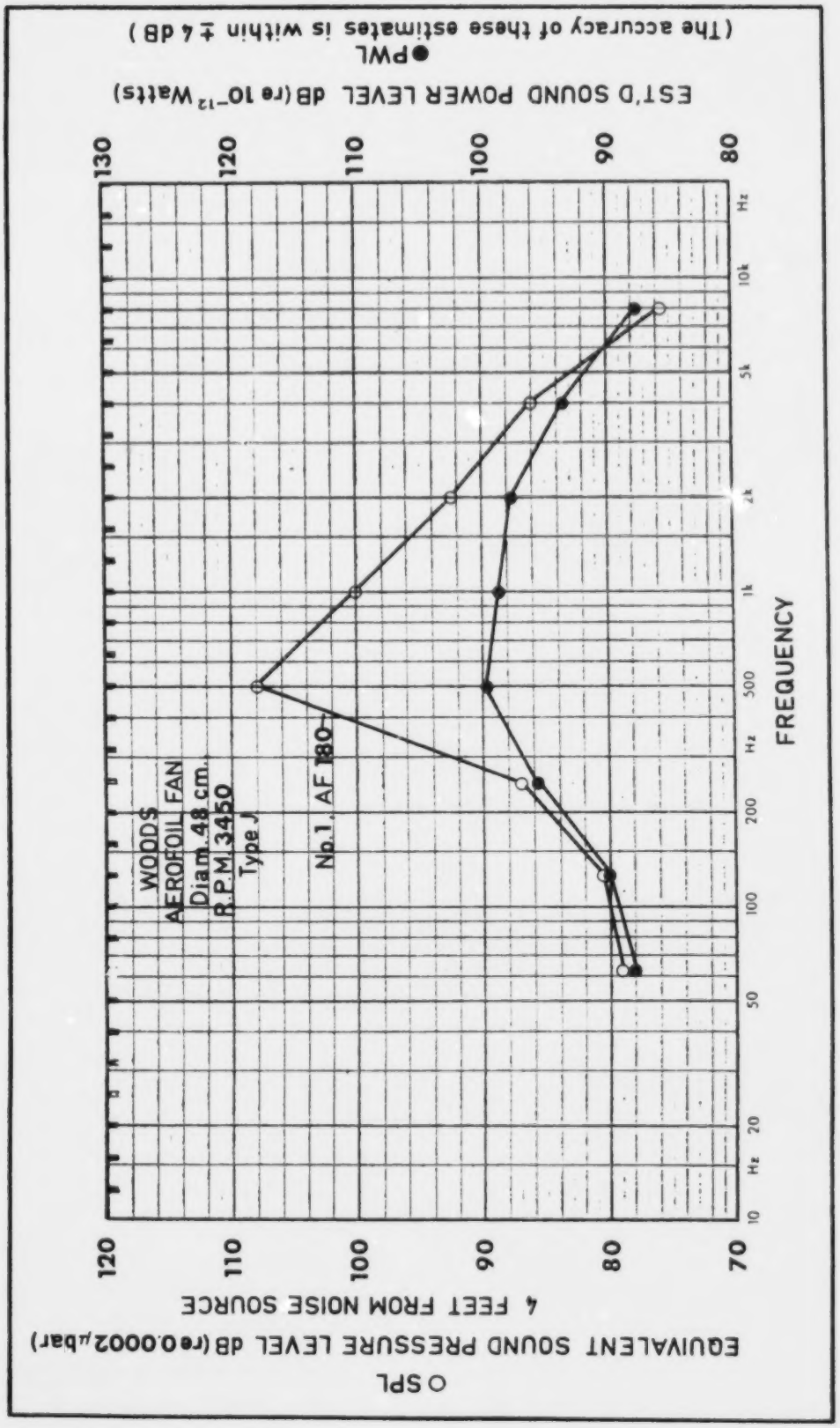


Figure 5.3: Comparison between Equivalent Sound Pressure Level (SPL) and calculated Sound Power Level (PWL). (The fan should be repaired.)

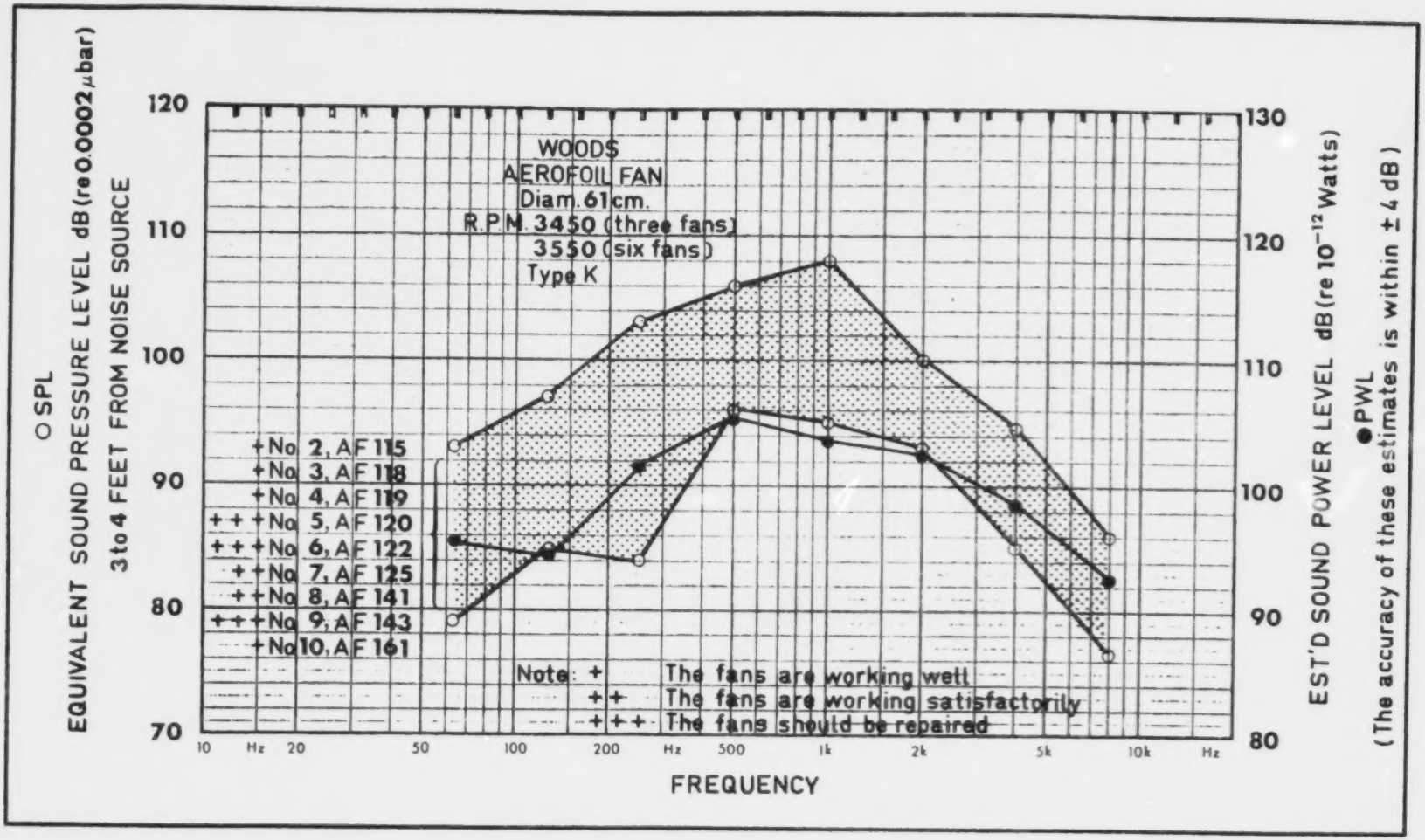

WOODS
AEROFOIL FAN
Diam. 61 cm.
R.P.M. 3450 (three fans)
3550 (six fans)
Type K
○ SPL
EQUIVALENT SOUND PRESSURE LEVEL dB (re 0.0002 μbar)
3 to 4 FEET FROM NOISE SOURCE
● PWL
EST'D SOUND POWER LEVEL dB (re 10^{-12} Watts)
(The accuracy of these estimates is within ± 4 dB)
+ No 2, AF 115
+ No 3, AF 118
+ No 4, AF 119
+ + + No 5, AF 120
+ + + No 6, AF 122
+ + No 7, AF 125
+ + No 8, AF 141
+ + + No 9, AF 143
+ No 10, AF 161
Note: + The fans are working well
+ + The fans are working satisfactorily
+ + + The fans should be repaired
120
110
100
90
80
70
130
120
110
100
90
80
10 Hz 20 50 100 200 Hz 500 1k 2k 5k 10k Hz
FREQUENCY

Figure 5.4: Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL). (Some fans need better maintenance).

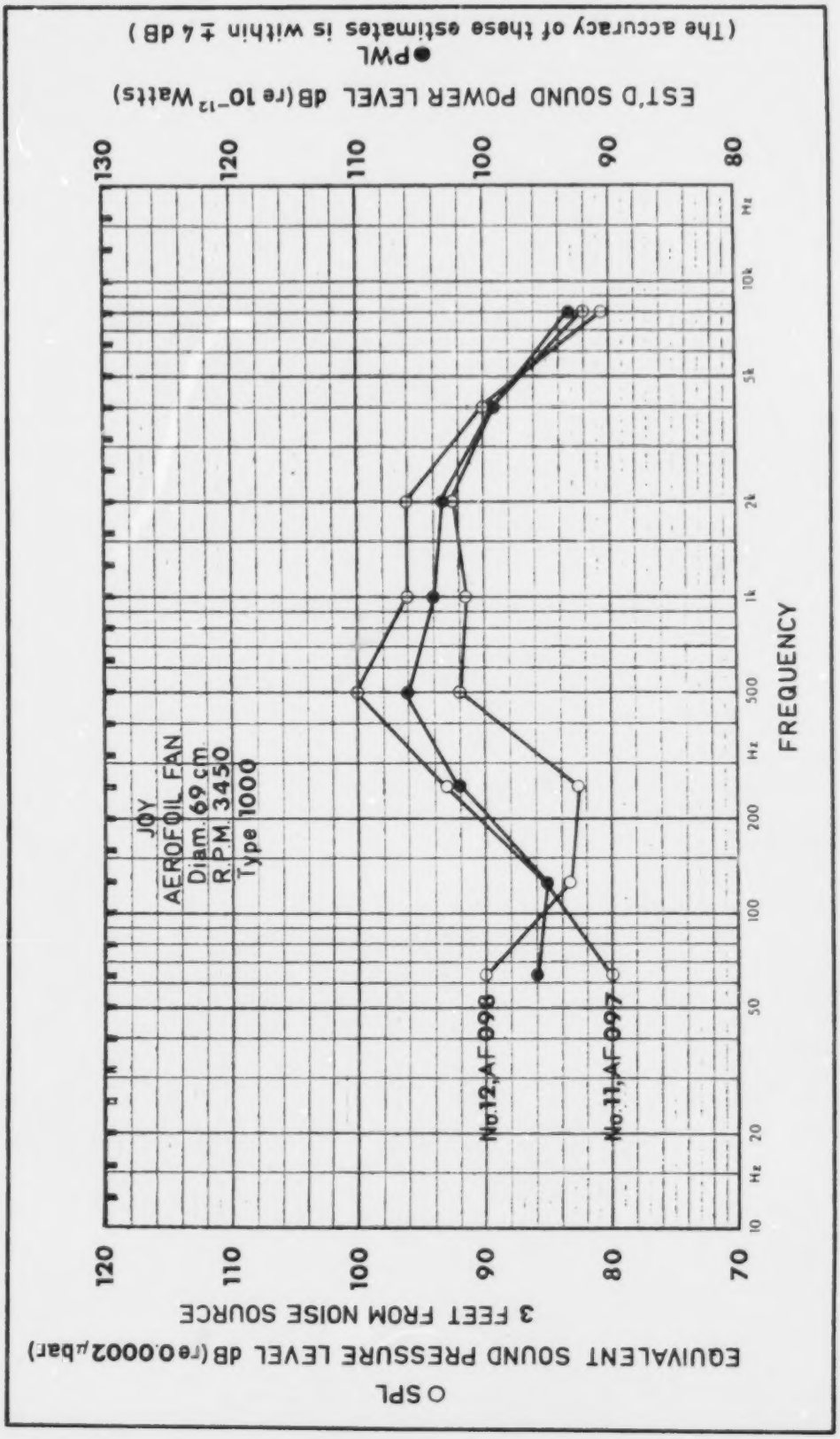

○ SPL
EQUIVALENT SOUND PRESSURE LEVEL dB (re 0.0002 μbar)
3 FEET FROM NOISE SOURCE
ESTIMATED SOUND POWER LEVEL dB (re 10⁻¹² Watts)
● PWL
(The accuracy of these estimates is within ± 4 dB)
FREQUENCY
JOY
AEROFOIL FAN
Diam. 69 cm
R.P.M. 3450
Type 1000
No.12, AF 098
No.11, AF 097
10 Hz 20 50 100 200 500 1k 2k 5k 10k
120 110 100 90 80 70
130 120 110 100 90 80

Figure 5.5: Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL).

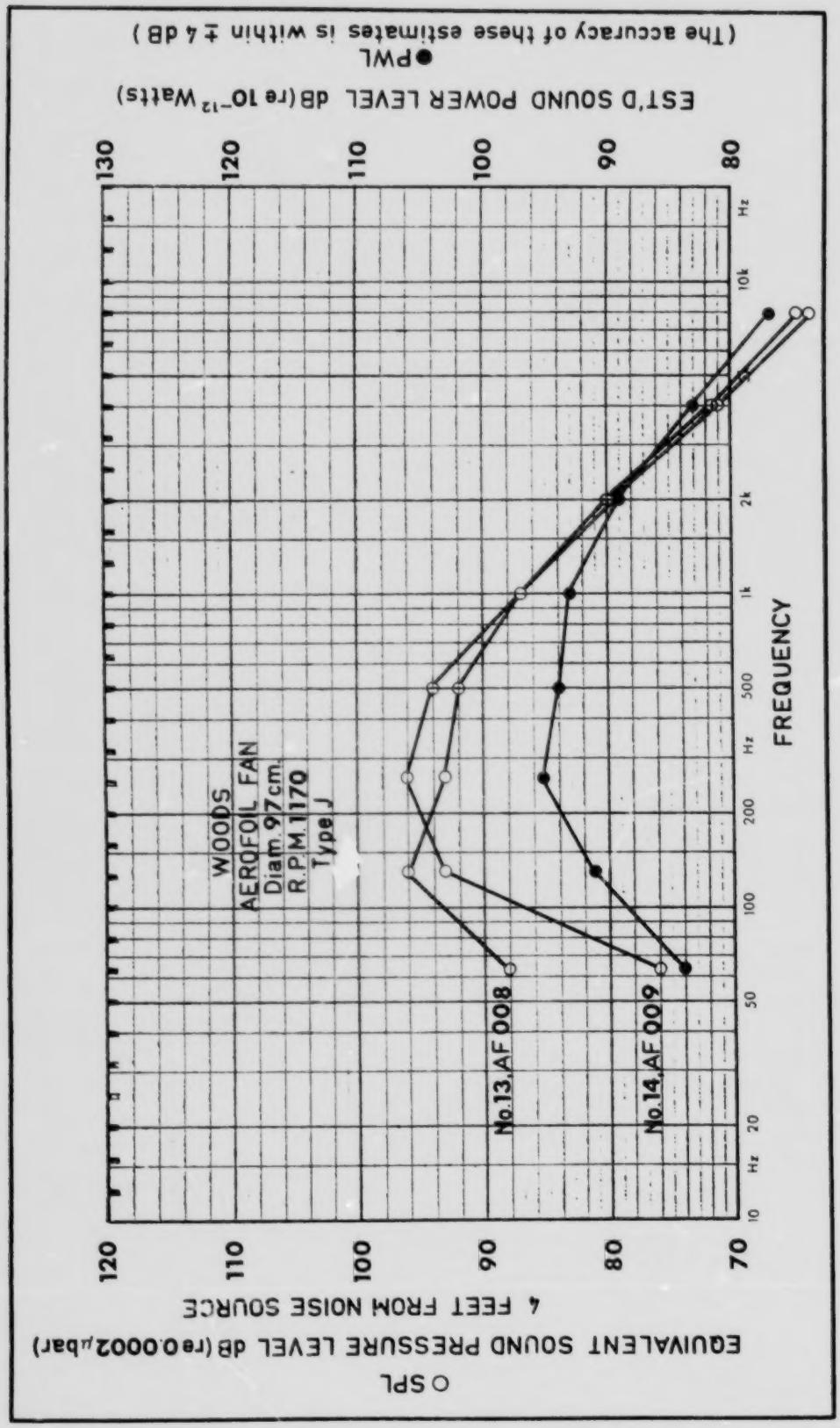


Figure 5.6: Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL). (Typical Increases of Noise are caused by Blades. Blade angles could be improved.)

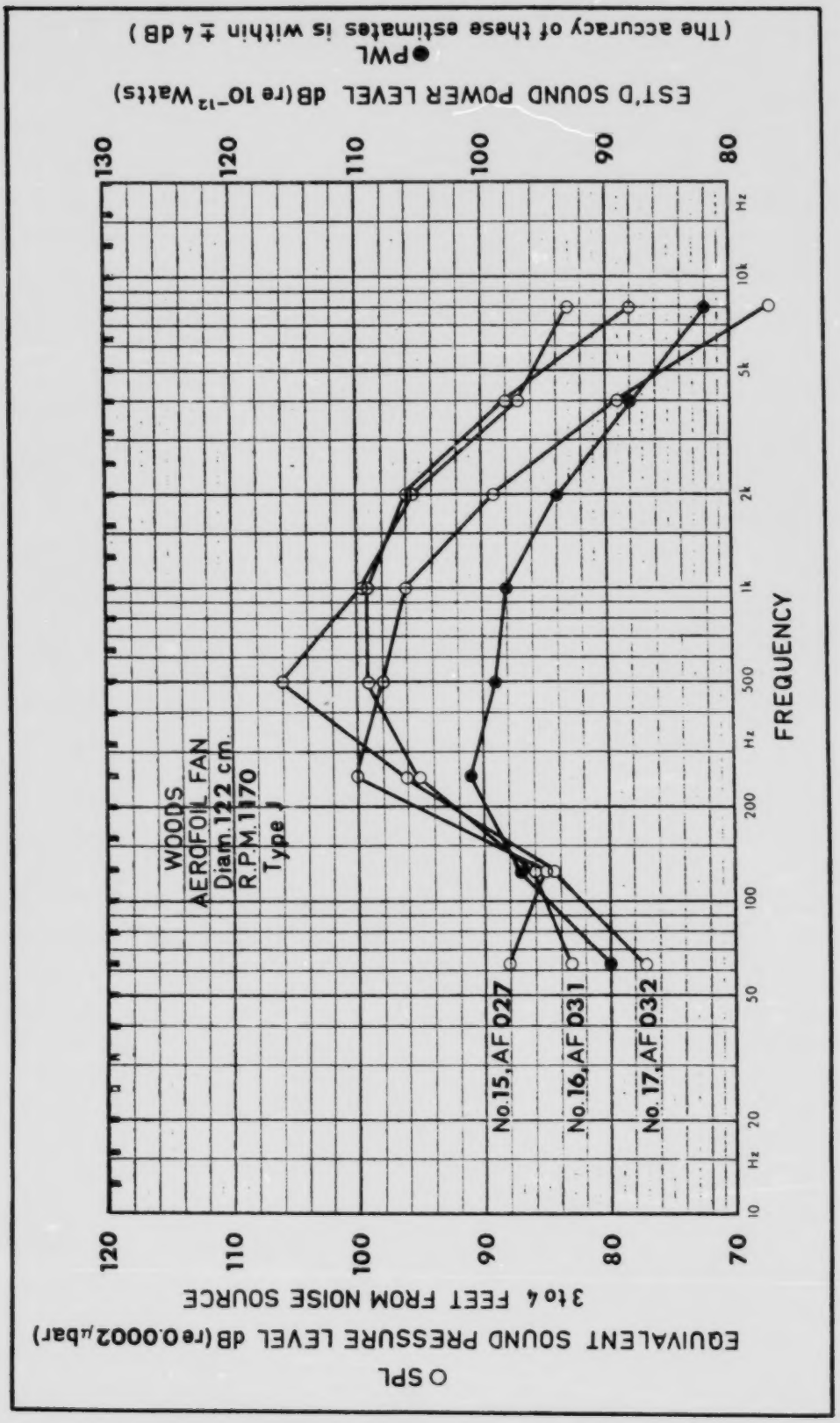


Figure 5.7: Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL). (Fans should be repaired).

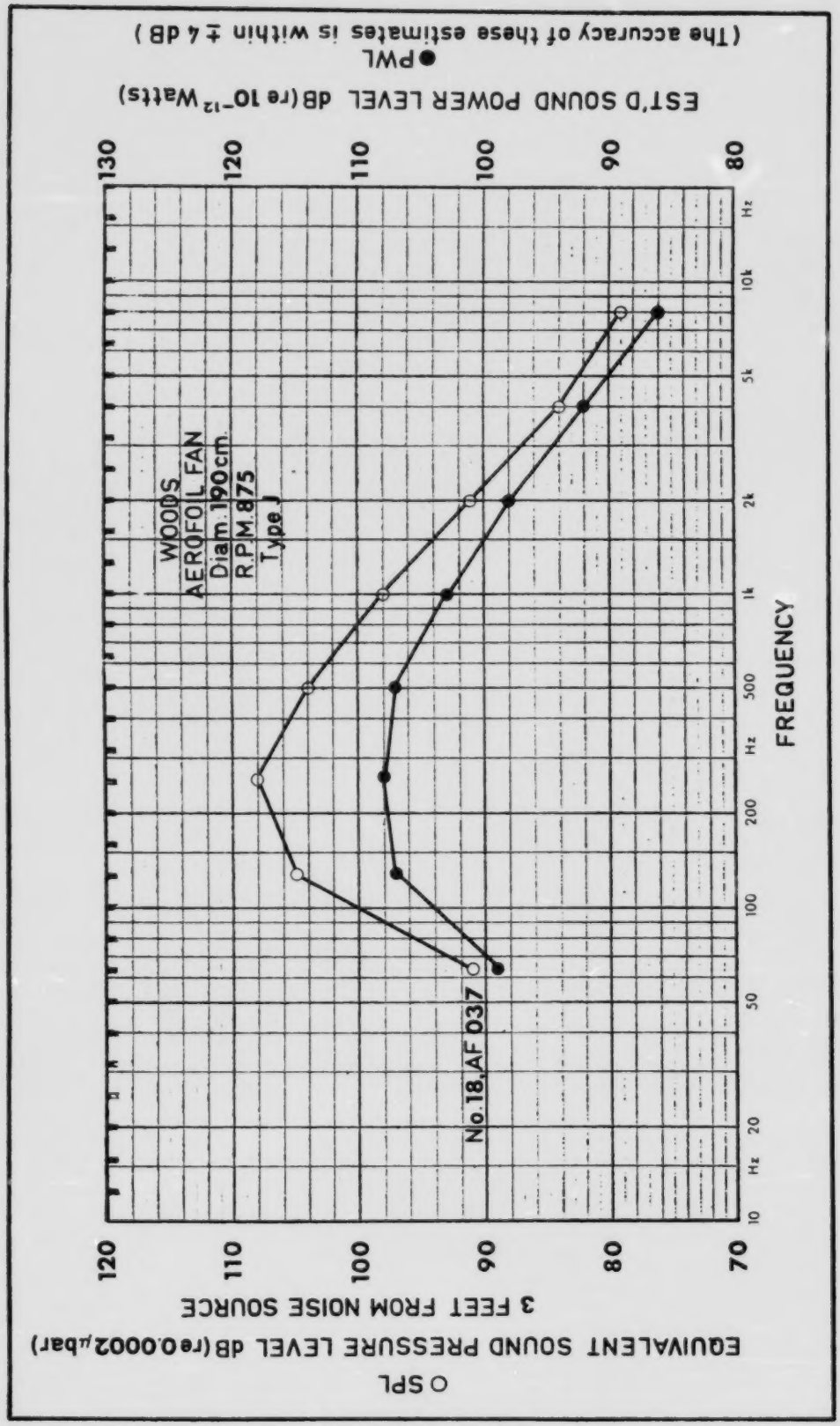


Figure 5.8: Comparison between Equivalent Sound Pressure Level (SPL) and Calculated Sound Power Level (PWL). (Blade angles could be improved?)

$$\left.\begin{aligned} PWL &= 90 + 10 \log hp + \log p \\ PWL &= 55 + 10 \log q + 20 \log p \\ PWL &= 125 + 20 \log hp - 10 \log q \end{aligned}\right\} \quad \text{Eq. (5.6)}$$

where: PWL = sound-power level of total noise spectrum (20 to 10000 Hz), dBre 10^{-12} W.

hp = rated motor horsepower,

p = static pressure, in. $H_2 0$,

q = fan discharge, cfm (ft^3/min)

Any one of these equations should give the over-all PWL within $\pm$ 4dB for conventional air fans (Table 5.1). If the measured results correspond to these limits, this is a good indication that fans are working well. Special designs of fans may fall outside these limits.

The octave band spectral power levels (PWL) can be estimated from the total PWL values by distributing the total power in accordance with the correction power spectrum from factory data. Each of the preceding fan types has particular noise characteristics associated with it. All curves of predicted octave band spectral power levels are shown in Figures 5.3 to 5.8.

Data of noise measurements from Table 5.2 are plotted in Figures 5.3 to 5.8 to compare equivalent sound pressure levels of casing noise with estimated sound power levels.

The peak noise frequency was predicted by calculating the frequency of the fundamental discrete blade passing tones (f) by formula (19) (Table 5.3):

TABLE 5.1

Evaluation of Over-all Sound Power Levels (PWL) from Fans in No. 12 Mine

No.	Fan No.	Manufacturer	Type	hp	q (cfm)	p in. H_2O	Over-all Sound Power Level (PWL) in dB re 10^{-12}W			
							90+10 log hp+10 log p	55+10 log q+20 log p	125+20 log hp-10 log q	Mean
1	AF 1[illegible]	Woods	Axial Flow J	7.2	7,000	3.6	104	105	107	105.3
2	AF 115	Woods	Axial Flow K	30	16,500	4	111	109	113	110.4
3	AF 118	Woods	Axial Flow K	25	16,500	4	110	109	111	
4	AF 119	Woods	Axial Flow K	27	16,500	4	110	109	112	
5	AF 120	Woods	Axial Flow K	25	16,500	4	110	109	111	
6	AF 122	Woods	Axial Flow K	25	16,500	4	110	109	111	
7	AF 125	Woods	Axial Flow K	25	16,500	4	110	109	111	
8	AF 141	Woods	Axial Flow K	25	16,500	4.5	110	110	111	
9	AF 143	Woods	Axial Flow K	25	16,500	4.5	110	110	111	
10	AF 161	Woods	Axial Flow K	38	17,000	4	112	109	115	
11	AF 097	Joy	Axial Flow 1000	20	12,600	6	111	112	110	111
12	AF 098	Joy	Axial Flow 1000	20	12,600	6	111	112	110	
13	AF 008	Woods	Axial Flow J	12	28,000	1	101	99.5	102.5	101
14	AF 009	Woods	Axial Flow J	12	28,000	1	101	99.5	102.5	
15	AF 027	Woods	Axial Flow J	40	55,000	1	106	102.5	109.5	106
16	AF 031	Woods	Axial Flow J	50	55,000	1	107	102.5	111.5	
17	AF 032	Woods	Axial Flow J	30	42,000	1	105	101	109	
18	AF 037	Woods	Axial Flow J	100	130,000	2	113	112	114	113

TABLE 5.2

Octave Band Measurements of Noise from Fans in No. 12 Mine

No.	Fan No.	Manufacturer	Type	Diameter in cm	Volume			dB - Frequency(Hz)								dBA		dBC		Location	Note
					kW	rpm	m³/min	63	125	250	500	1k	2k	4k	8k	Meas	Est'd	Meas	Est'd		
1	AF 180	Woods	Axial Flow J	48	5.4	3450	198	79	80.5	87	107.5	100	94.5	86	75.5	106.5	106.3	107.5	108.5	1900-#1 SUB W.O.Z.	Side, 4 feet away
2	AF 115	Woods	Axial Flow K	61	22.4	3550	467	78.5	85	84	104	95	96	90	80	103.5	103.5	106	105.3	1900-62 SILL STOPE	Side, 4 feet away
3	AF 118	Woods	Axial Flow K	61	18.7	3550	467	83	84.5	87	106	98.5	94.5	87.5	76.5	105	105	106	107.1	2350-16 N X-CUT	Side, 4 feet away
4	AF 119	Woods	Axial Flow K	61	20.1	3450	467	86.5	85	91	99	99	95.5	88.5	81	102.5	102.4	103.5	103.4	2350-#1 SUB (NORTH)	Side, 3 feet away
5	AF 120	Woods	Axial Flow K	61	20.1	3450	467	92.5	96.5	99	103	108	93	87	80	103	108.9	106	110	2350-F-1 DR. (N)	Side, 4 feet away
6	AF 122	Woods	Axial Flow K	61	18.7	3550	467	85	90	97	102.5	97	92.5	85	77	101.5	102.4	105	104.9	2350-#1 INCLINE (S)	Side, 4 feet away
7	AF 125	Woods	Axial Flow K	61	18.7	3550	467	85	90	91.5	96	99	100	94.5	85.5	107	104.2	107	104.2	2350-F-1 DR. (N)	Side, 4 feet away
8	AF 141	Woods	Axial Flow K	61	18.7	3550	467	89	91	92	99.5	100.5	97.5	90	82	103.5	103.9	104.5	104.8	1900-#3 SUB -88 ACC X-CUT	Side, 4 feet away
9	AF 143	Woods	Axial Flow K	61	18.7	3550	467	87	92	103	105.5	102	98	90.5	82	107	106	109	109	1900-F.W.DR.N	Side, 4 feet away
10	AF 161	Woods	Axial Flow K	61	28.3	3450	481	84	85.5	83.5	97	95.5	96	92	84	101.5	101.2	101.5	101.6	2350-5-S X-CUT	Side, 4 feet away
11	AF C37	Joy	Axial Flow 1000	69	14.9	3450	357	80	85	93	100	96	96	90	80.5	103	101.9	101	103.2	1900-H.W. EXH. DR.	Side, 3 feet away
12	AF 038	Joy	Axial Flow 1000	69	14.9	3450	357	90	83	82	92	91	92.5	89	82	97.5	97.4	99.5	98.1	2350-H.W. EXH. DR.	Side, 3 feet away
13	AF 008	Woods	Axial Flow J	97	9	1170	793	88	96	93	92	87	79.5	71	64.5	92	92.5	100	99.3	1900-#3 SUB (S)	Side, 4 feet away
14	AF 009	Woods	Axial Flow J	97	9	1170	793	76	93	96	94	87	80	71.5	63.5	92	93.9	99	99.8	1900-#2 SUB	Side, 4 feet away
15	AF 027	Woods	Axial Flow J	122	29.8	1170	1558	88	85	100	98	96	89	79	67.5	99.5	99.8	104	103.5	1900-10 N B.H.	Side, 4 feet away
16	AF 031	Woods	Axial Flow J	122	37.3	1200	1558	83	86	95	98.5	99	96	88	78	99.5	102.5	103	103	1900-8 N B.H.	Side, 4 feet away
17	AF 032	Woods	Axial Flow J	122	22.4	1170	1189	77	84.5	96	105.5	99.5	95.5	87	83	103.5	105.1	107	107.2	2350-#1 SUB	Side, 3 feet away
18	AF 037	Woods	Axial Flow J	190	74.6	875	3681	91	105	108	104	98	91	84	79	104	104.7	111	111	2350-23-3A O.P.	Side, 3 feet away

$$f = \frac{k \cdot N}{60} \quad \text{---------- Eq. (5.7)}$$

where k = number of blades

N = speed (rpm).

From Table 5.3 it is evident that the results of four measurements are not valid. All four measurements were taken with a hand meter.

5.3 Noise Control

On the basis of octave band measurements of casing noise from fans, and estimated sound power levels, an analysis for noise control treatment was executed (Table 5.4).

From the table it is seen that a great number of fans need maintenance. Average noise levels of 18 fans are 103.3 dBA. Normally, exposure time is small since miners are only passing by and high sound levels cause only a transient nuisance. Where miners are affected an investigation should be made to see whether a new work site can be arranged.

Vignette

TABLE 5.3

The Frequency of the Fundamental Discrete Blade Passing Tunes from Fans in No. 12 Mine

No.	Fan No.	Manufacturer	Type	Diameter in cm	Number of blades(N)	Speed (rpm)	Frequency (Hz); $f=\frac{N \times rpm}{60}$	Agreement with Meas. Results	Method of Measurement	
									Level Record.	Hand Meter
1	AF 180	Woods	Axial Flow J	48	10	3450	575	+	+	
2	AF 115	Woods	Axial Flow K	61	10	3550	592	+	+	
3	AF 118	Woods	Axial Flow K	61	10	3550	592	+		+
4	AF 119	Woods	Axial Flow K	61	10	3450	575	+		+
5	AF 120	Woods	Axial Flow K	61	10	3450	575	-		+
6	AF 122	Woods	Axial Flow K	61	10	3550	592	+		+
7	AF 125	Woods	Axial Flow K	61	10	3550	592	-		+
8	AF 141	Woods	Axial Flow K	61	10	3550	592	+	+	
9	AF 143	Woods	Axial Flow K	61	10	3550	592	+	+	
10	AF 161	Woods	Axial Flow K	61	10	3450	575	+		+
11	AF 097	Joy	Axial Flow 1000	69	12	3450	690	+	+	
12	AF 098	Joy	Axial Flow 1000	69	12	3450	690	+		+
13	AF 008	Woods	Axial Flow J	97	10	1170	195	+	+	
14	AF 009	Woods	Axial Flow J	97	10	1170	195	+	+	
15	AF 027	Woods	Axial Flow J	122	10	1170	195	+	+	
16	AF 031	Woods	Axial Flow J	122	10	1200	200	-		+
17	AF 032	Woods	Axial Flow J	122	10	1170	195	-		+
18	AF 037	Woods	Axial Flow J	190	12	875	175	+	+	

TABLE 5.4

Analysis of Noise Levels Generated and Noise Control Treatment of Fans in use in No. 12 Mine

No.	Fan No.	Manufacturer	Type	dBA		* N(P)	Permissible Exposure Limit* (hr)		Recommendations**
				Meas	Est't		Without Ear Muffs	With Ear Muffs	
1	AF 180	Woods	Axial Flow J	106.3	106.3	68	0.81	No limit	The fan should be repaired.
2	AF 115	Woods	Axial Flow K	103.5	103.5	70	1.28	No limit	The fan is working well.
3	AF 118	Woods	Axial Flow K	105	105	72	1.0	No limit	The fan is working well.
4	AF 119	Woods	Axial Flow K	102.5	102.4	65	1.42	No limit	The fan is working well.
5	AF 120	Woods	Axial Flow K	103	108.9	68	1.32	No limit	The fan should be repaired.
6	AF 122	Woods	Axial Flow K	101.5	102.4	68	1.41	No limit	The fan should be repaired.
7	AF 125	Woods	Axial Flow K	107	104.2	62	0.75	No limit	The fan is working satisfactorily.
8	AF 141	Woods	Axial Flow K	103.5	103.9	73	1.23	No limit	The fan is working satisfactorily.
9	AF 143	Woods	Axial Flow K	107	105	73	0.75	No limit	The fan should be repaired.
10	AF 161	Woods	Axial Flow K	101.5	101.2	62	1.41	No limit	The fan is working well.
11	AF 097	Joy	Axial Flow 1000	103	101.9	66	1.32	No limit	The fan is working well.
12	AF 098	Joy	Axial Flow 1000	97.5	97.4	68	2.83	No limit	The fan is working well.
13	AF 008	Woods	Axial Flow J	92	92.5	68	6.07	No limit	The blade angles could be improved (?)
14	AF 009	Woods	Axial Flow J	92	93.9	66	6.07	No limit	The blade angles could be improved (?)
15	AF 027	Woods	Axial Flow J	99.5	99.8	70.5	3.64	No limit	The fan should be repaired.
16	AF 031	Woods	Axial Flow J	99.5	102.5	65	3.64	No limit	The fan should be repaired.
17	AF 032	Woods	Axial Flow J	103.5	105.1	71.5	1.23	No limit	The fan should be repaired.
18	AF 037	Woods	Axial Flow J	104	104.7	80	1.15	No limit	The blade angles could be improved (?)
			Σ/18 =	103.3	103.6				

6. CRUSHING PLANTS

In the No. 12 mine, the primary crushing plants are located near the centre of gravity of the ore body at the 1550 ft. and 2950 ft. levels. Both crushing plants have similar capacities and the same opening sizes.

In all underground operations the primary crushing plant should work as part of a team, complementing the transportation equipment and shaft-ore pass system. Average operating time of each crusher is 3.5 to 4 hours per shift.

Noise measurements were performed on the crushing plant at the 2950 ft. level (Figure 6.1). The jaw crusher (200 hp, 500 t/h, 60 in. jaw) is suitable for many applications where the ore is "blocky" because of its large feed opening. For shipping current jaw crusher production to the skip, an elevated belt is used.

The measurements of noise are done in five places (Figure 6.1):

1. Crusher Operator, full shift observation (No. 1);
2. Transfer at Crusher, pin-point measurement (No. 2);
3. Half-way up Belt, pin-point measurement (No. 3);
4. Crusher Helper, pin-point measurement (No. 4);
5. Skip Tender Helper, pin-point measurement (No. 5).

The results of these measurements are summarized in two tables in Figure 6.1. The highest noise levels are on the storage silo (No. 4) and between the loading chutes and shaft (No. 5).

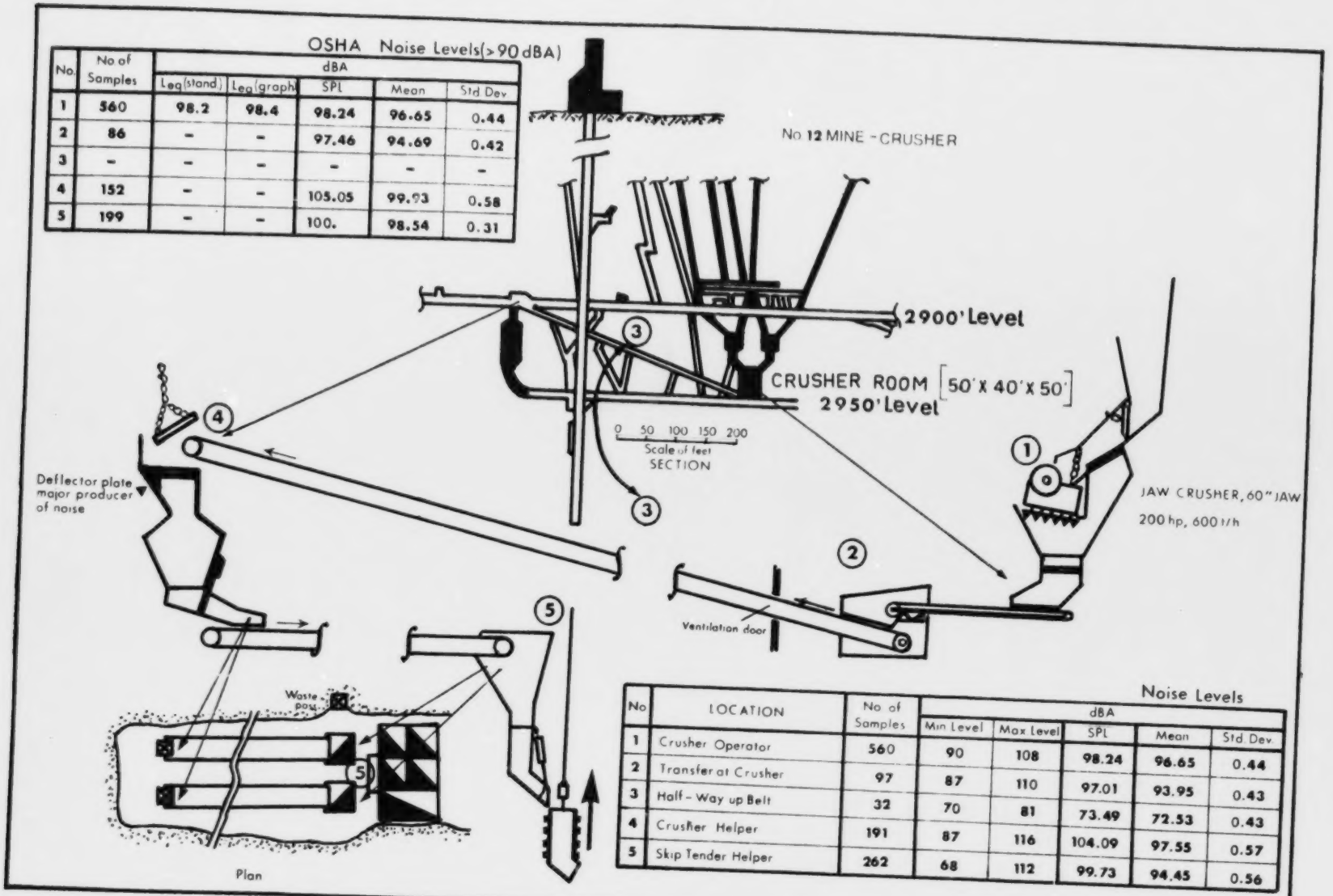

OSHA Noise Levels(>90 dBA)
No. | No of Samples | dBA | | | | |
| | | Leq(stand.) | Leq(graph) | SPL | Mean | Std Dev |
1 | 560 | 98.2 | 98.4 | 98.24 | 96.65 | 0.44
2 | 86 | - | - | 97.46 | 94.69 | 0.42
3 | - | - | - | - | - | -
4 | 152 | - | - | 105.05 | 99.93 | 0.58
5 | 199 | - | - | 100. | 98.54 | 0.31
No 12 MINE - CRUSHER
2900' Level
CRUSHER ROOM [50' X 40' X 50']
2950' Level
0 50 100 150 200
Scale of feet
SECTION
Deflector plate major producer of noise
JAW CRUSHER, 60" JAW
200 hp, 600 t/h
Ventilation door
Waste pass
Plan
Noise Levels
No | LOCATION | No of Samples | dBA | | | | |
| | | Min Level | Max Level | SPL | Mean | Std Dev.
1 | Crusher Operator | 560 | 90 | 108 | 98.24 | 96.65 | 0.44
2 | Transfer at Crusher | 97 | 87 | 110 | 97.01 | 93.95 | 0.43
3 | Half - Way up Belt | 32 | 70 | 81 | 73.49 | 72.53 | 0.43
4 | Crusher Helper | 191 | 87 | 116 | 104.09 | 97.55 | 0.57
5 | Skip Tender Helper | 262 | 68 | 112 | 99.73 | 94.45 | 0.56

Figure 6.1: Jaw Crusher at the 2950 Ft. Level.

6.1 Jaw Crusher

The noise on the jaw crusher operators' seat was observed with a level recorder. The recorder trace shows typical steady-state repeated impact noise (Figure 6.2).

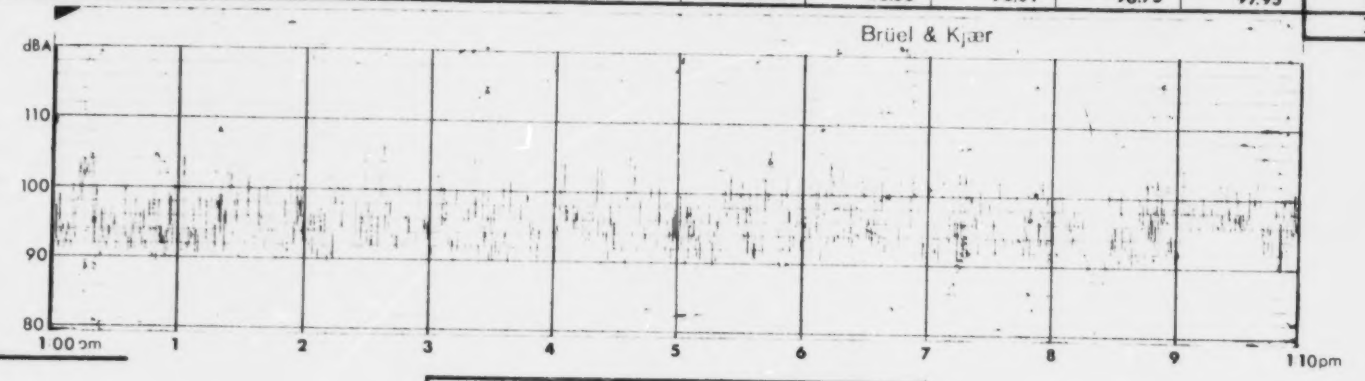
Evaluation of the Noise Exposure Index was made on the basis of a short measurement. Before that, results were compared by means of numerical and graphical evaluations. The evaluation showed that the same results were obtained using the faster graphical method:
(numerical $\overline{SPL}$ = 97.95 dBA) ≈ (graphical $\overline{SPL}$ = 97.89 dBA)

Besides that, it is evident that the main noise levels are repeated and that on the basis of short measurements, the results for a full shift can be obtained adequately.

For evaluation of the noise exposure index, a one minute noise level reading was taken in the following time periods: 8.40 a.m., 12.10 p.m., and 12.50 p.m. The numerical information was transformed into graphs (Appendix 2). The average working time of the jaw crusher is 3.5 to 4 hours per shift. Because of this, the noise exposure index varied between 1.46 and 1.63. In both situations, equivalent sound levels are equal (L_{eq} = 98.4 dBA). An equivalent sound level was defined in terms of that equivalent steady noise level which, in a given period of time, would contain the same noise energy as the time-varying noise during the same period.

The background noise consists of the jaw crusher's electric motor noise and its belt noise. In Figure 6.3, the characteristic peak noise produced by the electric motor can be seen at 63 Hz. The spectral noise of

No. of Samples	130	146	128	119	115	116	120	122	103	113	1212
Mean	95.11	94.79	95.55	95.05	96.52	96.12	96.6	96.38	95.26	97.03	95.81
Std Dev	0.33	0.27	0.31	0.32	0.39	0.36	0.32	0.32	0.32	0.27	0.104
SPL	97.09	96.29	97.21	96.83	98.83	98.83	98.00	98.01	96.75	97.95	97.95



STANDARD

GRAPHICAL

Reading	Mean	Std Dev	SPL
1 dBA	96.03	0.1	96.83
2 dBA	96.27	0.1	96.89
OSHA	96.93	0.11	97.89

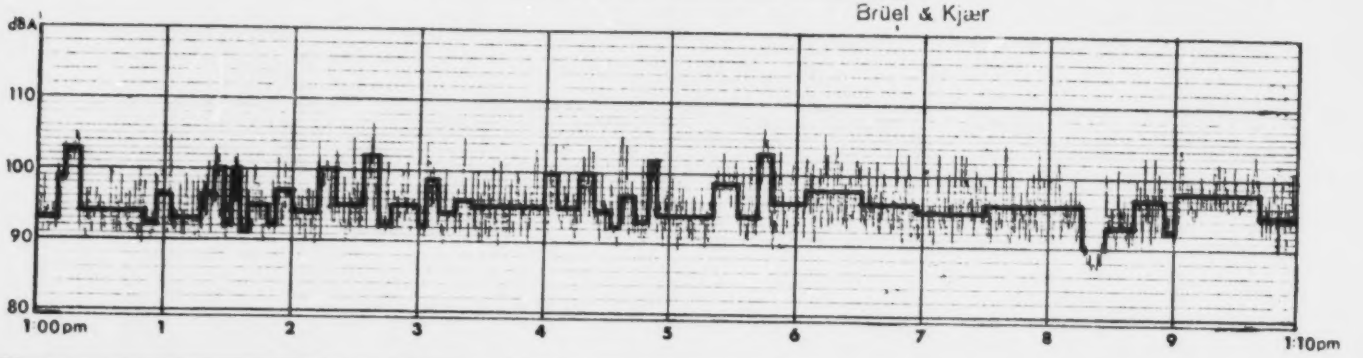


Figure 6.2: Typical Recorder Trace for Jaw Crusher.
Accuracy Evaluation Comparisons between Standard and Graphical Methods.

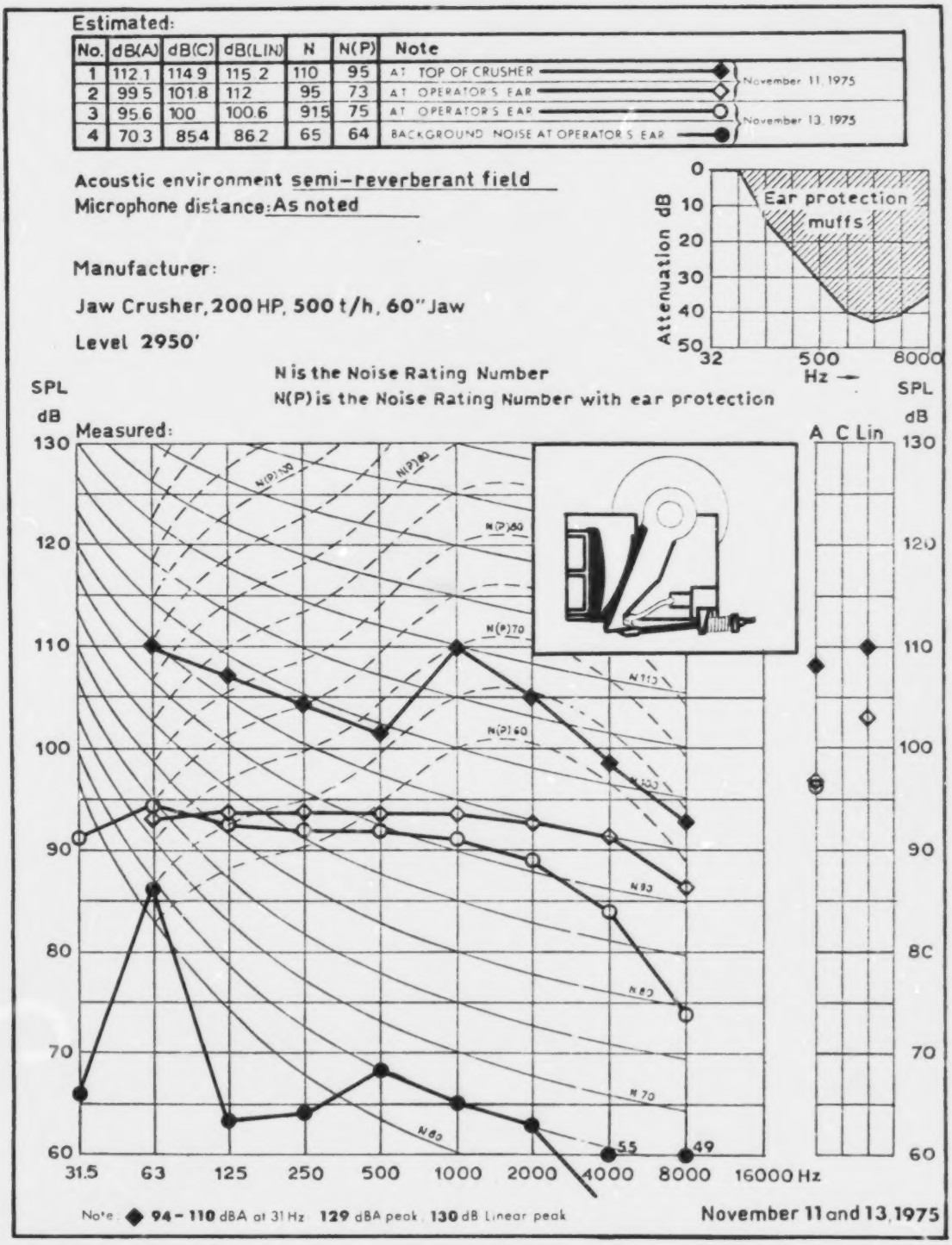

Estimated:
No. dB(A) dB(C) dB(LIN) N N(P) Note
1 112.1 114.9 115.2 110 95 AT TOP OF CRUSHER — November 11, 1975
2 99.5 101.8 112 95 73 AT OPERATOR'S EAR
3 95.6 100 100.6 91.5 75 AT OPERATOR'S EAR — November 13, 1975
4 70.3 85.4 86.2 65 64 BACKGROUND NOISE AT OPERATOR'S EAR
Acoustic environment semi-reverberant field
Microphone distance: As noted
Manufacturer:
Jaw Crusher, 200 HP, 500 t/h, 60" Jaw
Level 2950'
Attenuation dB
Ear protection muffs
Hz
N is the Noise Rating Number
N(P) is the Noise Rating Number with ear protection
SPL dB
Measured:
A C Lin
N(P)90
N(P)80
N(P)70
N(P)60
N110
N100
N90
N80
N70
N60
55
49
31.5 63 125 250 500 1000 2000 4000 8000 16000 Hz
Note: 94 - 110 dBA at 31 Hz 129 dBA peak 130 dB Linear peak
November 11 and 13, 1975

Figure 6.3: Frequency Spectrum of Noise at the Jaw Crusher.

of the jaw crusher is approximately flat from 31 Hz to 4 kHz.

The characteristic noise levels of the jaw crusher are:

No.	Description	dBA
1	Ore pass dumping	114 - 118
2	Jaw Crusher feeder	100 - 114
3	Crushing - large piece of ore	112
4	Crushing - small piece of ore	95

The crushing noise has the longest time period. At the crusher transfer (Figure 6.1, No. 2) the principal noise source is still the crusher itself.

6.2 Storage Bins

Major noise sources are from two places: storage bins and loading. At the end of the belt at the 2900 ft. level, the major producer of noise is the deflector plate, 105 dBA (Figure 6.1). The noise reduction NR (in dBA)* is achievable by changing the drop height, or by changing the impact angle. Storage bin controls of ore impact noise are (20):

1. Bin with reduced drop height and steeper impact angle, and
2. Bin with impact shield or lining.

Rubber linings are not a cure-all for noise problems and suffer from abrasion (21). At incline angles of 5 to 30 degrees, steel resists impact abrasion better than rubber. The rubber sandwiched between two pieces of steel can be used to reduce the noise level or other methods can be applied to make use of rubber under these severe impact conditions.

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* The Noise Reduction values should apply to the overall A weighted (dBA) levels, and not to the separate noise components.

In LKAB, Luleå, Sweden, the deflector plate has been replaced by SKEGA serrated wear components. The life span of the steel liner was 1,000,000 tons of material transported, while the rubber liner has been operating during a period of time corresponding to 6,000,000 tons. The noise level has also been lowered from 91 decibels to 74, a reduction of 80% (22).

To reduce the impact caused by ore in bins and chutes wear components should be used. The material should not be permitted to drop more than 4.6 m (15 ft.). The skip tender helper is also exposed to high noise levels. The bottom area, and skip door should be lined with rubber components on the point of impact only.

6.3. Noise Exposure of Operators in Crushing Plants

The noise does not vary from one day to the next, because the average working time is 3.5 to 4 hours. The operators are always exposed to the same machine with the same capacity of production. Typical results of the noise exposure limits are summarized in Table 6.1.

The results from Table 6.1 of the noise exposure limits for a normal 8 hour working day show that workers must wear hearing protectors, except those workers on the belt. Not a single exposure limit lasts for a longer period of time than 3.5 to 4 hours.

TABLE 6.1

Permitted Duration of Noise in Crushing Plants (Figure 6.1)

No.	Location	L_{eq} (dBA)	Exposure Limits (h)	
			Without Ear Muff	With Ear Muff
1	Crusher Operator	98.2	2.566	No limit
2	Transfer at Crusher	97.5	3.233	No limit
3	Half-way up Belt	-	-	-
4	Crusher Helper	105.05	1.007	No limit
5	Skip Tender Helper	100	2.0	No limit

7. ROCK DRILLS AND ASSOCIATED EQUIPMENT

Most of the rock drilling machines used in underground mining operations are specially manufactured for that purpose.

Rock drills and associated equipment noise is produced from air exhaust, drill steel vibration, radiation from the drill body, internal noise from valve and the penetration noise from the rock.

Measurements were taken from the following machines:

1. Pneumatic Rock Drills. The drill consists of a piston which gives a series of impacts to the drill rods. The rotation is produced by the movement of the piston in the cylinder and it is not designed to remove rock:
   a) Jackdrill (Feed) Legs: Consists of sinker drills attached to demountable air feed leg.
   b) Stoper: Rock Drills designed with an air feed as an integral part thereof.
   c) Mobile Mountings for Drills:

- "Wills"Stope Wagon, Two Drills (IR - 300);
- 630 Stope Jumbo, Two Rock Drills (BBC 100 F); and
- Jarvis Clarke MJM - 21, Three booms (ES - 300) Jumbo.

2. Associated Equipment:

a) Diamond Drills. A cylindrical bit is rotated at a relatively high speed, and it is designed to remove the rock cylinder into a core-barrel to act as a sample or core.

b) Raise Boring Machine, for continuous boring of large diameters, mainly powered by electric power.

The following factors must be considered in noise control investigations on rock drills and associated equipment:

1. Source of noise must be determined;
2. Sound levels and frequencies must be measured; and
3. Air-and structure-borne paths should be integrated into the problem.

7.1 Jacklegs

The Ingersoll-Rand JR - 300A Jackdrill is a high performance integrated rock drill and air-feed leg unit designed for drilling in any position. In response to demands by industrial and health authorities to reduce noise in mines, Ingersoll-Rand has introduced a new muffled version of the JR 300M Jackdrill. Muffling is accomplished with no loss in drill performance and with only a slight increase in the overall weight. These muffled drills are substantially quieter than non-muffled machines (Figure 7.1).

As shown by Figure 7.1, muffled drills reduce the all-pass noise level by 6 decibels. From the results in Table 7.1, and later evaluations

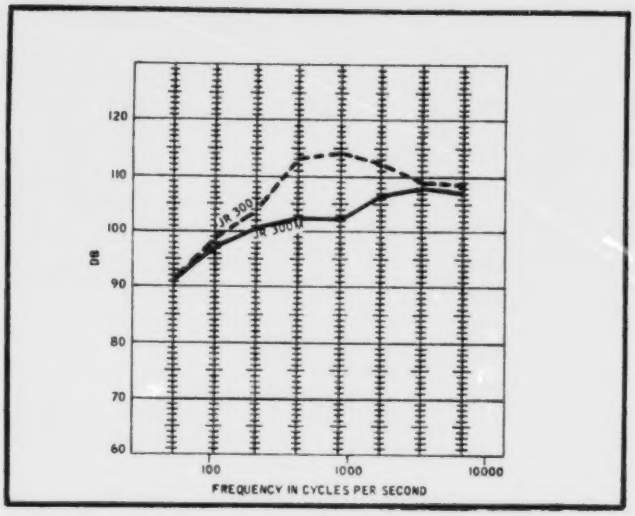


Figure 7.1: Muffled Drills reduce the all-pass Noise Level (23).

of L_{eq}, it can be seen that the attenuation is actually less:

	dBA		
	Without Muffler	With Muffler	Difference
Max.	125	121	4
Leq	122.5	119	3.5
$\overline{SPL}$	120.9	117.6	3.3
Mean	119.5	116.9	2.6

Results of noise attenuation from the factory are usually higher by 2 - 3 dBA. All rock drills have similar situations. Thus it can be concluded, that factory measurements were performed in a free-field (24).

One measurement was made with a Noise Classifier, Model 166 at 98 Stope, 1900 ft. level:

E.I.	Time (h)	Leq (dBA)
10.463	1.57	119.5

The equivalent continuous noise level is similar to the above, 119.5 dBA $\approx$ 119 dBA.

TABLE 7.1

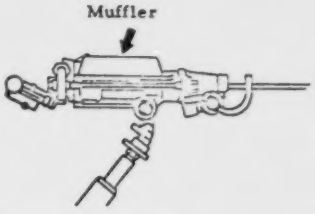
Comparison of Noise Data between Muffled and Non-Muffled Drills

(Show measuring location with an X.)

2350' LEVEL

Ingersoll-Rand 300A

98 STOPE, 1900' LEVEL



Ingersoll-Rand 300M

	1933 Precision Sound Level Meter, Gen Rad and Stop-Watch					
	With Muffler			Without Muffler		
	November 07, 1975*			November 11, 1975**		
dBA Max Level	C+	T++	$\frac{C}{T}$	C	T	C
125	0.0167	1/16	0.2672	0.5487	1/16	8.7792
120	1.1098	1/8	8.8784	0.3804	1/8	3.044
115	0.2306	¼	0.9224	0.0111	¼	0.0444
110	0.0098	½	0.196	0.0667	½	0.1334
105	0.0167	1	0.0167	0.0111	1	0.0111
102	0.0111	1½	0.0074	0.0083	1½	0.0055
100	0.0056	2	0.0028	0.0028	2	0.0014
97		3		0.0028	3	0.0009
95		4		0.0042	4	0.00105
92		6			6	
90		8			8	
Total	1.4003		9.87402	1.0362		12.0209
Maxim	121			125		
$\overline{SPL}$•	117.604			120.912		
Mean	116.86			119.481		
Std.Dev.	0.0456			0.0797		

Note: Maximum Levels as measured on the "A_s" scale of the sound level Meter. If the reading is between levels specified, use the higher level.

* Measured from 8.52 am to end of drilling at 2.50 pm. Stopped for lunch 35 min.

** Measured from 11.08 am to end of drilling at 2.36 pm, stopped for lunch 11.20 to 12.05. Total measuring time: 2 h 43 min. 6 - 15' holes drilled.

\+ Total duration in hours.

++ Permissible hours per day.

• Average $\overline{SPL} = 10 \text{ Log } \frac{1}{n} (\text{antilog } \frac{SPL_1}{10} + \text{antilog } \frac{SPL_2}{10} + \text{---} + \text{antilog } \frac{SPL_n}{10})$

During measurements on the 7th November, 1975, a comparison of the noise exposure index was made using a noise dosimeter, and the resulting differences were high:

Noise Exposure Index		
Standard Method	Noise Dosemeter*	
	Over Muff	Under Muff
9.87	15.72	1.67

* See Table 3.3, No. 17.

According to the known period of noise measurement, the equivalent noise level will be L_{eq} = 122.6 dBA. This value would correspond to the Jackleg without a muffler. Because of these reasons, in judging the results, we must be very cautious.

Pneumatic drill mufflers were designed for control of the exhaust noise. The present investigation extends this work to the mechanical noise and the noise emitted from the drill rod.

7.2 Stoper

Model RB 83 Stoper Gardner-Denver is designed to give a high speed and power for drilling in all formations. A powerful rotation, with large extra strength rotation parts, makes this machine good for roof bolting applications. Model RB 83M reduces noise levels without sacrificing drilling rates, while providing the same advantages as Model RB 83 (25).

Several systems have been designed and tested that reduce the noise level to the OSHA Safety range (26).

At the 2350 ft. level, noise measurements of stoper drills (RB 83) were carried out by three surveyors. The first and second surveyors

performed their measurement at 5 - IN Stope, and the third surveyor performed his at the western level. The results of the measurement are shown in Table 7.2. The first surveyor's measurements are the only ones that have any real value for the following reasons:

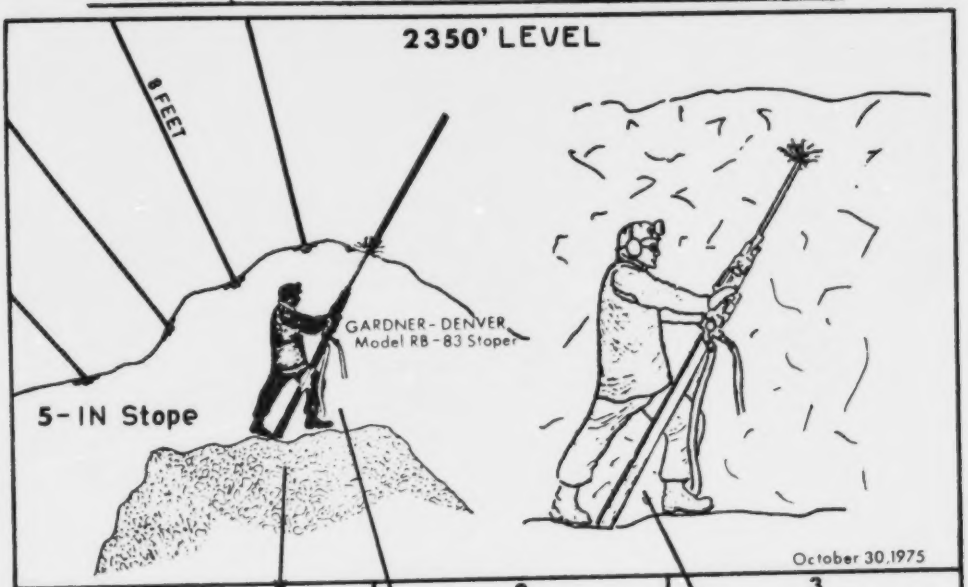
1. Sound Level Meter Type 2205, B & K, had a long enough extension cable (6 m) for the microphone to be placed near the operator's ear.
2. Impulse Precision Sound Level Meter Type 2209 B & K, had a short extension cable (3 m). The sound level meter had to be moved with great caution because of big ore pieces and little room (5 - IN Stope). Because of this the microphone was not always in the vicinity of the operator's ear, but the time of noise duration is correct. In the relation time - exposure index from 8.30 to 11.30 a.m., we can easily calculate the exposure index from 12.30 p.m. to 3.00 p.m.
3. 1933 Precision Sound Level Meter, Gen Rad had no extension cable, and taking measurements near the operator's ear was very difficult.

In Table 7.2, differences in the values for maximum level, $\overline{SPL}$ and Mean shows that our claim is correct. The obtained results in Table 7.2, columns 2 and 3 will be re-evaluated according to column 1; 2nd then they will be extended to the OSHA level (>115 dBA). Thus we have the following Table 7.3.

In the interval from 12.30 p.m. to 3.00 p.m., according to noise histograms, the rock bolter drilled 15 holes, each 8 ft. deep. Noise histograms of each hole were similar to one another (Figure 7.2). The average time of drilling and anchoring is 4.92 minutes in the interval from 12.30 p.m. to 3.00 p.m.

TABLE 7.2

Noise Exposure Index and Noise Data from Stoping



	1 Sound Level Meter Type 2205, B & K and Stop Watch			2 Impulse Precision Sound Level Meter Type 2209 B & K, and Level Recorder Type 2306, B&K			3 1933 Precision Sound Level Meter, Gen-Rad and Stop Watch*		
	From 8.30 am - 11.30 am			From 12.30 pm - 3.00 pm			From 10.00 am - 2.50 pm		
dBA Max Level	C+	T++	$\frac{C}{T}$	C	T	$\frac{C}{T}$	C	T	$\frac{C}{T}$
>115	0.4579	None	∞	0.179	None	∞		None	
115	0.545	$\frac{1}{4}$	2.18	0.73	$\frac{1}{4}$	2.92	1.1694	$\frac{1}{4}$	4.678
110	0.082	$\frac{1}{2}$	0.164	0.135	$\frac{1}{2}$	0.27		$\frac{1}{2}$	
105	0.02	1	0.02	0.035	1	0.035		1	
102		$1\frac{1}{2}$			$1\frac{1}{2}$			$1\frac{1}{2}$	
100		2			2		0.0056	2	0.003
97		3			3			3	
95		4		0.015	4	0.0037		4	
92	0.021	6	0.0035	0.137	6	0.0228		6	
90	0.006	8	0.0008	0.0062	8	0.0008	0.0069	8	0.001
Total	1.1319		2.37+∞	1.2372		3.25+∞	1.1819		4.682
Maximum	122			117			115		
$\overline{SPL}$•	115.02			112.83			113.05		
Mean	114.13			109.4			112.59		
Std. Dev	0.061			0.233			0.072		

Note: Maximum Levels as measured on the "A_s" scale of the sound level meter. If the reading is between levels specified, use the higher level.

* Drill operated 60% of time in morning and 56% of time in afternoon.

\+ Total duration in hours per day.

++ Permissible hours per day.

• Average $\overline{SPL} = 10 \text{ Log } \frac{1}{n} (\text{antilog } \frac{SPL_1}{10} + \text{antilog } \frac{SPL_2}{10} + \text{-----} + \text{antilog } \frac{SPL_n}{10})$

TABLE 7.3

Correction of the Noise Exposure Index from Table 7

	1	2	3
	From 8.30-11.30 am	From 12.30-3.00 pm	From 10.00-2.50 pm
Time (h)	1.13	1.24	1.18
E.I.	6.03	6.59	6.31
Leq (dBA)	117	~117	117
No. of holes per 8 ft.	~14	15	~14

The noise spectrum level decreases with decreasing frequency. (Figure 7.3). Sounds having most of their energy in the speech frequencies are more potent in causing a threshold shift than are sounds having most of their energy below the speech frequencies. Two measurements were executed in two different time periods. The results were similar.

The permitted duration of stoper noise would have no limits if operators would wear their ear muffs properly.

7.3 "Wills" Stope Wagon (IR - 300)

The "Wills" Heavy Duty Stope Wagon, Model "400", is self-propelled by a piston type air motor (4 - cylinder) coupled to a vane-type pump that powers the drive and all the hydraulic units (27). The Stope Wagon is designed to allow for good alignment of the drill steel during collaring of the hole and it is adaptable for use with any model drill. In this case the Stope Wagon was equipped with an Ingersoll-Rand IR -300 capable of drilling a hole $1\frac{1}{4}$ in. diameter and 14 ft. in length at an angle of 65°. It has a burden of 3 ft. 3 in. and a spacing of 4 ft. 6 in. The Wills Stope Wagon

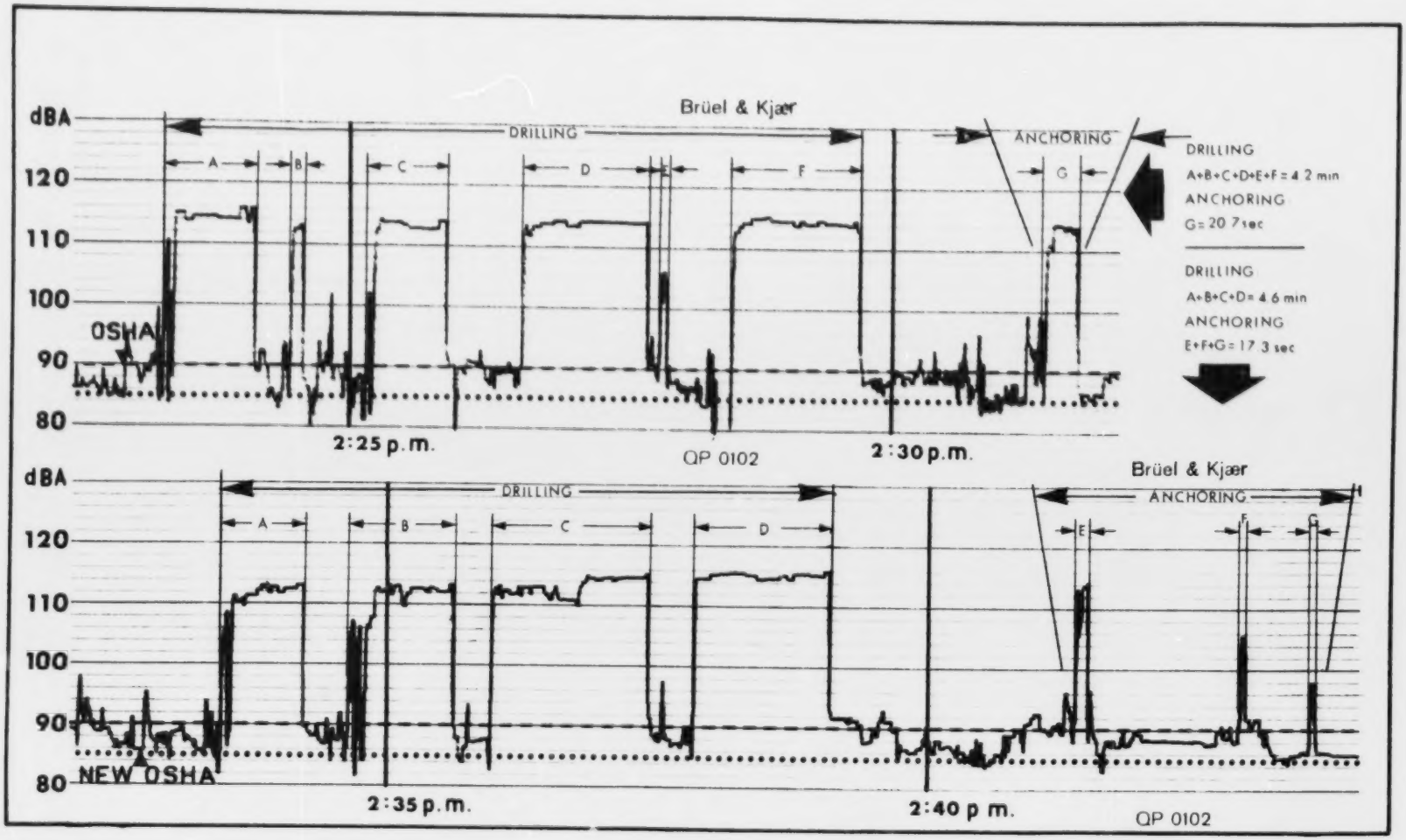


Figure 7.2: Noise Histograms of each Hole at 8 Feet depth are similar. When the new OSHA requirements are fulfilled the Noise Exposure Index will rapidly rise.

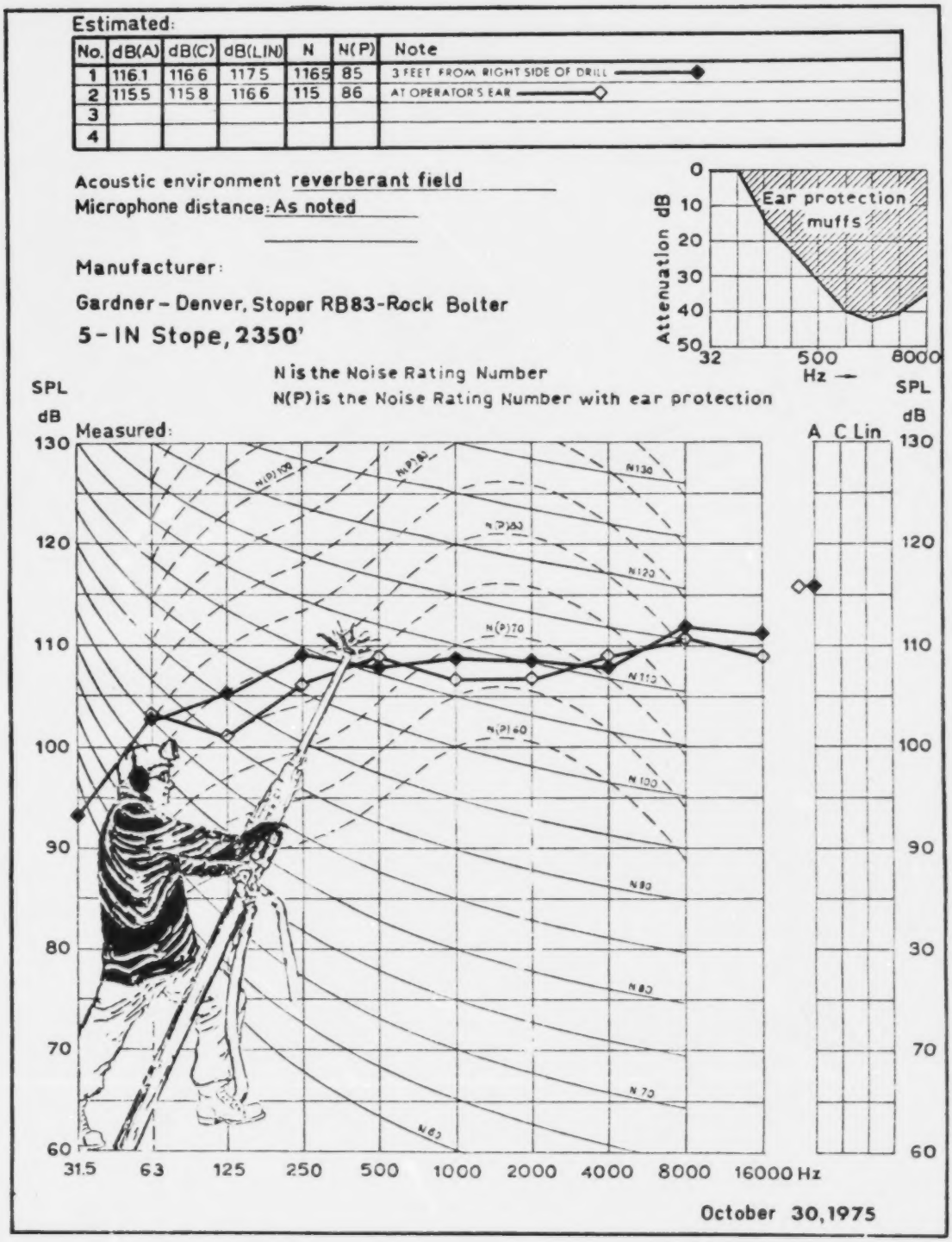


Figure 7.3: The Acoustic Energies only over the audible Range of Frequency (250 Hz to 2000 Hz) are equal.

produces a lift height of 12 ft.

The noise was measured using three different methods:

1. Impulse Precision Sound Level Meter and Level Recorder (From 9.25 a.m. to 12.22 a.m.);
2. Sound Level Meter and Stop Watch (From 11.28 p.m. to 3.00 p.m.); and
3. Two Noise Dosimeters (in left pocket and under earmuff).

Shown in Table 7.4 are separate and cumulative results during a full shift. The noise over 115 dBA was also evaluated to be compared with the exposure index of a noise dosimeter (Table 3.3, No. 10). Results are good because the tolerance range is within limits for Sound Level Meter, Type 2 (Table 3.1).

Noise Dosimeter ----------	11.19
Sound Level Meter ----------	10.17
	1.02

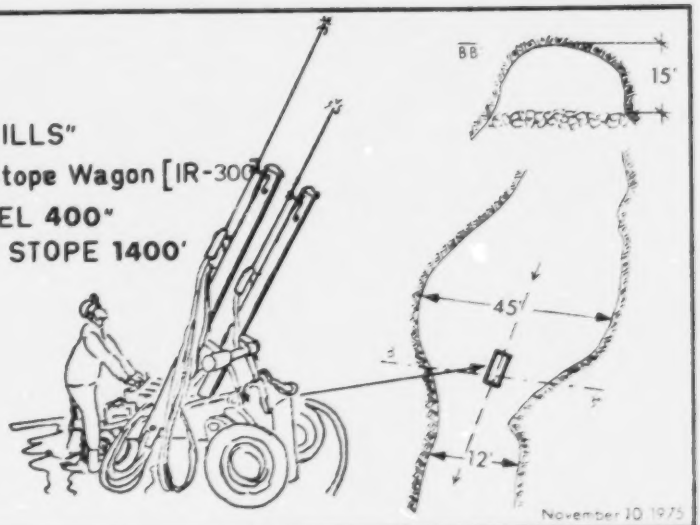
The difference in results is approximately 10%, and is therefore acceptable. For this reason the results are good.

During one full shift a miner drilled 26 holes each 14 ft. deep, 16 holes were made from 9.25 a.m. to 12.22 p.m. Because we used the graphical method, evaluation of this data was performed twice, within a space of three days, to see how large a difference would exist. The noise exposure index results were very close, $5.88 \approx 5.89$.

A detailed analysis was made for each 2 hole drilling set (Table 7.5). From Table 7.5, it is evident that all sets of observations were good, because L_{eq} is constant. In this example, it is evident that by using short

TABLE 7.4

Noise Exposure Index of Wills Stope Wagon Operators



	1			2			1 + 2		
	Impulse Precision Sound Level Meter Type 2209 B & K, and Level Recorder Type 2306, B&K			Sound Level Meter Type 2205, B & K and Stop Watch					
	From 9.25 am - 12.22 pm*			From 1.28 pm - 3.00 pm*			From 9.25 am - 3.00 pm		
dBA Max Level	C+	T++	$\frac{C}{T}$	C	T	$\frac{C}{T}$	C	T	$\frac{C}{T}$
120		1/8		0.349	1/8	2.792	0.349	1/8	2.792
115	1.429	1/4	5.716	0.375	1/4	0.5	1.804	1/4	7.216
110	0.046	1/2	0.092	0.003	1/2	0.006	0.049	1/2	0.98
105	0.033	1	0.033		1		0.033	1	0.033
102	0.002	1½	0.001	0.004	1½	0.003	0.006	1½	0.004
100	0.016	2	0.008		2		0.016	2	0.008
97	0.003	3	0.001		3		0.003	3	0.003
95	0.008	4	0.002		4		0.008	4	0.002
92	0.030	6	0.005		6		0.030	6	0.005
90	0.058	8	0.007	0.008	8	0.001	0.066	8	0.008
Total	1.625		5.865	0.739		4.302	2.364		10.169
Maxim.	115			117			117		
$\overline{SPL}$•	114.50			115.11			114.64		
Mean	113.033			114.60			113.382		
Std.Dev.	0.061			0.06			0.050		

Note: Maximum Levels as measured on the "A_s" scale of the sound level meter. If the reading is between levels specified, use the higher level.

* Drill operated 55% of time in morning and 48% of time in afternoon.

\+ Total duration in hours per day.

++ Permissible hours per day.

• Average $\overline{SPL} = 10 \text{ Log } \frac{1}{n} (\text{antilog } \frac{SPL_1}{10} + \text{antilog } \frac{SPL_2}{10} + \text{----- + antilog } \frac{SPL_n}{10})$

TABLE 7.5

Analysis of Noise Exposure Index for Wills Wagon Operator

No.	Time (h)	OSHA Noise Exposure Index										T. Time (Min.)	L_{eq} (dBA)
		90 dBA	92 dBA	95 dBA	97 dBA	100 dBA	102 dBA	105 dBA	110 dBA	115 dBA	Σ		
1	a.m. 9.25-9.40	0.001	0	0	0	0	0	0	0	0.56	0.561	8.89	114.8
2	9.40-10.00	0	0.014	0	0.001	0.001	0.001	0.003	0.002	0.823	0.845	13.71	114.8
3	10.08-10.23	0.002	0	0	0	0	0	0	0.029	0.784	0.815	13.82	114.7
4	10.23-10.45	0.002	0.002	0.001	0	0	0	0.005	0.012	0.879	0.901	15.47	114.7
5	10.45-11.20	0	0	0	0	0	0	0.001	0.003	0.737	0.741	11.32	115
6	11.20-11.40	0	0	0	0	0.001	0	0.003	0.038	0.804	0.846	13.70	114.6
7	11.40-11.53	0.001	0.001	0	0	0.004	0	0.002	0.005	0.604	0.617	10.5	114.7
8	11.53-12.22	0.001	0.001	0	0	0.001	0	0.020	0.003	0.529	0.555	10.11	114
		0.007	0.018	0.001	0.001	0.007	0.001	0.0034	0.092	5.72	5.881	97.52	114.6

measurements one can determine the noise exposure index with great precision. Thus it follows:

$$\frac{26}{2} \times \frac{5.881}{8} = 9.56 \text{ (E.I.)}$$

where: No. of holes = 26, and E.I. = 5.881 from (Table 7.5),

or from OSHA:

L_{eq} = 114.6 dBA ------- 0.263 h (time permitted)

Total time is 2.364 h ≈ 2.4 h (Table 7.4)

$$\frac{2.4}{0.263} = 9.13 \text{ (E.I.)}$$

and, approximately, $9.56 \approx 9.13 \approx 10.17$.

All results have tolerance limits with Sound Level Meter Type 2.

Octave band analyses of "Wills" Heavy Duty Stope Wagon (IR 300) showed that the noise was lower near the operator's ear for the same jackdrills. This occurs for three reasons (Figure 7.4).

1. The jackleg operator is closer to the drill hammer than the operator of a stoper.
2. The heavier stope wagon damps vibrations more, thus creating less noise.
3. Volume of the working area (Table 7.4)

The Stope Wagon with cable-pneumatic feed eliminates hand-holding of the drill, reducing operator fatigue from vibration. The pneumatic feed with a pressure regulator insures a steady continuous pressure on the drill steel. The noise is intermittent in nature where there are several periods of steady-state (continuous) noise. Cyclic intervals of background noise

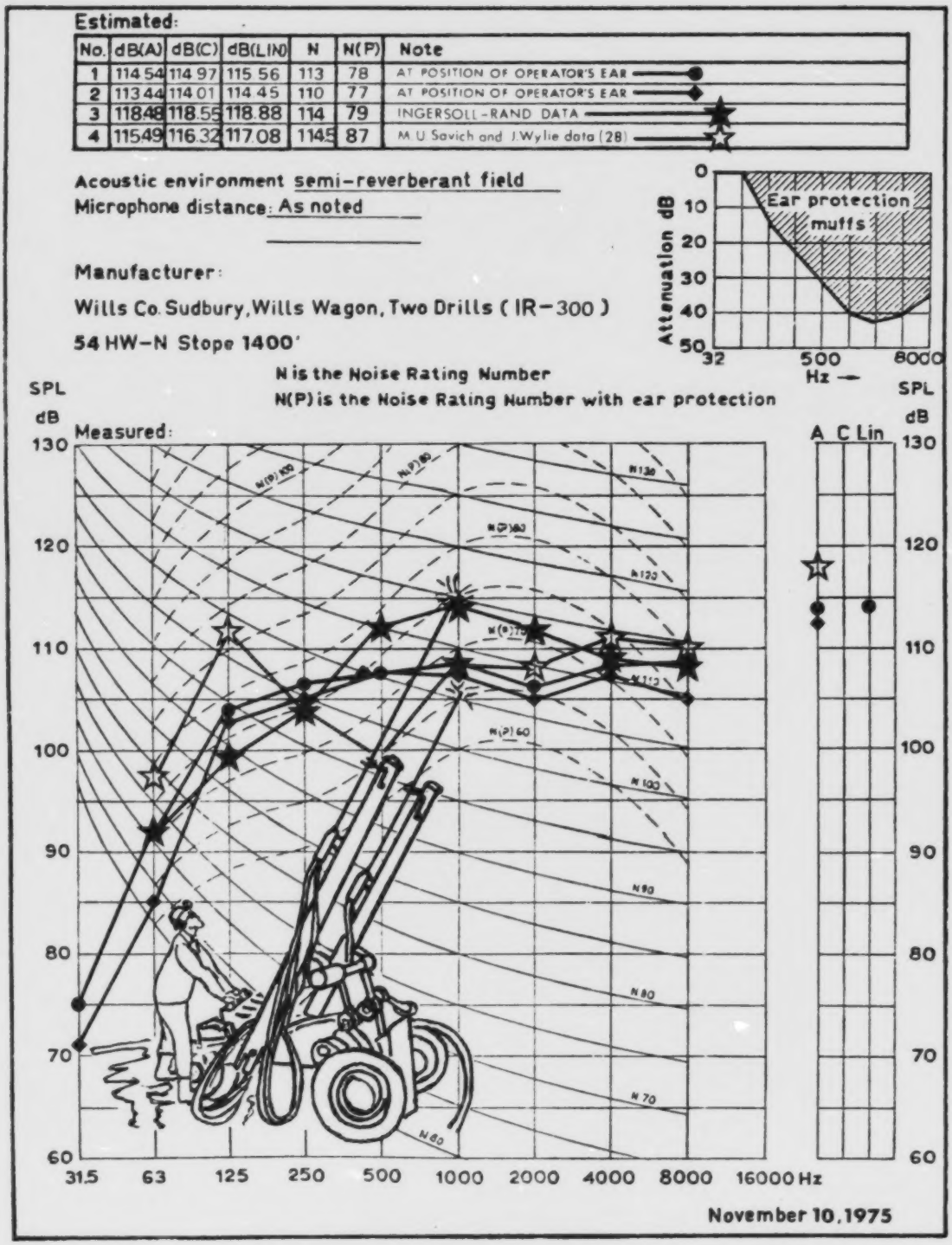

Estimated:
No. dB(A) dB(C) dB(LIN) N N(P) Note
1 114 54 114 97 115 56 113 78 AT POSITION OF OPERATOR'S EAR
2 113 44 114 01 114 45 110 77 AT POSITION OF OPERATOR'S EAR
3 118 48 118 55 118 88 114 79 INGERSOLL-RAND DATA
4 115 49 116 32 117 08 114 5 87 M U Savich and J.Wylie data (28)
Acoustic environment semi-reverberant field
Microphone distance: As noted
Manufacturer:
Wills Co. Sudbury, Wills Wagon, Two Drills (IR-300)
54 HW-N Stope 1400'
Attenuation dB
Ear protection muffs
Hz
N is the Noise Rating Number
N(P) is the Noise Rating Number with ear protection
SPL dB
Measured:
A C Lin
N130
N120
N110
N100
N90
N80
N70
N60
N(P)160
31.5 63 125 250 500 1000 2000 4000 8000 16000 Hz
November 10, 1975

Figure 7.4: Octave Band Noise Data at the Wills Wagon Operator's Station. No. 3 and 4 Data are from Jack Leg Drills (28).

are included.

The noise varies according to the number of drill hammers.

2 boom ---------- 113 - 115 dBA

1 boom ---------- 110 - 114 dBA

At the start of each hole, as the drill deflected while collaring, the noise level varied from 90 - 115 dBA. While moving the rig the noise level range is between 86 - 90 dBA.

The operator wore his ear muffs properly because his noise exposure index was 0.56 (Table 3.3, No. 10).

7.4. 630 Stope Jumbo.

Production drilling is carried out with mine development 630 Stope Jumbos. They incorporate a fixed arm mounted on a modified Eimco 630 carriage, on which are mounted two remote controlled BBC 100F rock drills that are capable of drilling 1 5/8 in. diameter holes, 14 ft. in length, at a dip angle of + 65° (29).

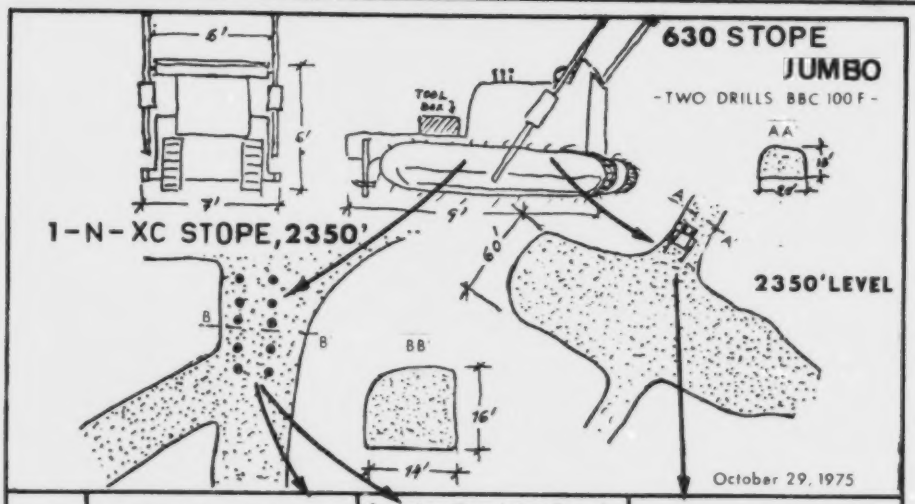
During noise measurement on October 29, 1975, the Jumbo operated 3 hours out of a normal 5 hour work cycle. The largest portion of sound pressure level/time distribution exceeds 115 dBA. The drilling was performed under similar conditions. All results are presented in Table 7.6.

To evaluate L_{eq} of this measurement, we needed to evaluate the noise exposure index over 115 dBA, and thus we have the following results in Table 7.7.

From 1.30 p.m. to 3.30 p.m. noise levels were recorded. From level recorder data, it can be seen that 6.2 holes each 14 ft. deep were made.

TABLE 7.6

Evaluations of Noise Exposure Index from 630 Stope Jumbo Operator



	Sound Level Meter Type 2205, B & K and Stop-Watch*			Impulse Precision Sound Level Meter Type 2209 B & K, and Level Recorder Type 2306, B&K*			1933 Precision Sound Level Meter, Gen-Rad and Stop-Watch		
	From 9.00 am - 11.15 am			From 1.30 pm - 3.30 pm			From 9.00 am - 2.54 pm		
dBA Max Level	C+	T++	$\frac{C}{T}$	C	T	$\frac{C}{T}$	C	T	$\frac{C}{T}$
>115	1.215	None	∞	0.271	None	∞	1.7013	None	∞
115	0.554	$\frac{1}{4}$	2.22	0.937	$\frac{1}{4}$	3.75	0.5154	$\frac{1}{4}$	2.062
110	0.025	$\frac{1}{2}$	0.05	0.059	$\frac{1}{2}$	0.12	0.0223	$\frac{1}{2}$	0.045
105	0.033	1	0.03	0.011	1	0.01	0.0028	1	0.003
102		$1\frac{1}{2}$		0.008	$1\frac{1}{2}$	0		$1\frac{1}{2}$	
100		2		0.029	2	0.01	0.0153	2	0.008
97	0.021	3	0.01	0.006	3	0	0.0056	3	0.002
95	0.098	4	0.02	0.025	4	0.01	0.0333	4	0.008
92	0.095	6	0.02	0.019	6	0	0.0528	6	0.009
90		8		0.011	8	0	0.2542	8	0.032
Total	2.041		2.35+∞	1.376		3.90+∞	2.6030		2.17+∞
Maxim	117			116			120		
$\overline{SPL}$*	114.96			114.75			116.34		
Mean	111.96			113.54			113.056		
Std. Dev	0.71			0.074			0.093		

Note: Maximum Levels as measured on the "A_s" scale of the sound level meter. If the reading is between levels specified, use the higher level.

*Operator was working in a closer space in the morning. Microphone was held close to operator. 2 holes drilled before we arrived at location.

**Operator was in more open space due to stope 7-N-XC in afternoon. Microphone was held 3 to 4 feet behind operator due to short length of cable to sound level meter type 2209.

+Total duration in hours per day.

++Permissible hours per day.

*Average $\overline{SPL} = 10 \text{ Log } \frac{1}{n}(\text{antilog } \frac{SPL_1}{10} + \text{antilog } \frac{SPL_2}{10} + \text{----} + \text{antilog } \frac{SPL_n}{10})$

TABLE 7.7

Correction of the Noise Exposure Index from Table 7.6

dBA Level	1		2		3	
	From 9.00 am - 11.15 am		From 1.30 pm - 3.30 pm		From 9.00 am - 2.54 pm	
	Time (h)	E.I.	Time (h)	E.I.	Time (h)	E.I.
90-115	0.826	2.35	1.105	3.90	0.9017	2.17
115-120	1.215	9.72	0.271	2.17	1.7013	13.61
90-120	2.041	12.07	1.376	6.07	2.6030	15.78
L_{eq}	118.2		116		118	

The time required to drill 2 holes is 26.6 min. In the morning, from 9.00 a.m. to 11.15 a.m. the first surveyor observed noise for 2.041 h, and during this time he finished 9.2 holes. Actually he finished 10 holes, because he started work at 8.30 a.m. The total exposure index of 630 Stope Jumbo Operator from 8.30 a.m. to 3.30 p.m. will be 19.19. In Table 3.3, No. 11, it is shown that the 630 Stope Jumbo Operator has a 29.44 E.I. (!).

During one full shift the complete measurement was performed and sets of measurements were taken. In Table 7.8 the results of exposure index and time are different. These are dependent upon the length of holes. The length of each hole is dependent upon slope altitudes. For this reason there are three groups of results:

1. Exposure index : 0.303 to 0.386;
2. Exposure index : 0.406 to 0.593; and
3. Exposure index : 0.606 to 0.897.

The average L_{eq} (112.5 dBA), is low, much lower than was estimated before from Table 7.7. Large openings, slope altitudes, backfill, and

TABLE 7.8

Noise Exposure Index Evaluations in Relation to Set Observations, 48 H.W. Stope W.O.Z, November 7th, 1975.

No.	Time (h)	OSHA - Noise Exposure Index										T. Time	L_{eq}
		90 dBA	92 dBA	95 dBA	97 dBA	100 dBA	102 dBA	105 dBA	110 dBA	115 dBA	Σ	(Min.)	(dBA)
1	a.m. 9.00-9.25	0.0007	0.0005	0.0025	0.0037	0.0092	0.0151	0.0157	0.0443	0.5667	0.6584	15.04	112
2	9.25-10.00	0.0021	0.0004	0.0007	0.0018	0.0077	0.0074	0.0212	0.1	0.7553	0.8966	15.7	114
3	10.00-10.20	0	0.0028	0	0.0041	0.0033	0.0044	0.0105	0.043	0.52	0.6281	10.66	113.2
4	10.20-10.35	0	0.0002	0.0016	0.0018	0.0037	0.0027	0.0017	0.043	0.352	0.4063	8.16	113
5	10.35-10.55	0	0.0008	0.0013	0.0028	0.006	0.0037	0.0078	0.0183	0.4707	0.5114	10.22	112.4
6	10.55-11.05	0.0001	0	0.0005	0.0024	0.009	0.0007	0.0083	0.0297	0.3333	0.3835	8.17	112.3
7	11.05-11.15	0	0.0005	0.0005	0	0.0014	0.0049	0.007	0.0443	0.3	0.3576	7.14	113.1
8	11.15-11.30	0	0.0006	0.0002	0.0018	0.0013	0.0024	0.024	0.0147	0.3407	0.3857	7.97	112.6
9	p.m. 12.30-12.45	0	0.0003	0	0.0014	0.0018	0.005	0.0092	0.013	0.352	0.3827	7.35	113.3
10	12.45-12.55	0	0.0001	0.0005	0.0016	0.0014	0.0074	0.0028	0.0223	0.2667	0.3028	6.1	113
11	12.55-1.25	0.0003	0.001	0.0028	0.0028	0.0027	0.0225	0.0203	0.0853	0.5133	0.651	15.51	111.3
12	1.25-1.55	0	0.0002	0.0134	0.0043	0.0093	0.0136	0.0097	0.0703	0.4853	0.6061	16.37	112.9
13	1.55-2.15	0	0.0003	0.0008	0.0040	0.0060	0.0059	0.0047	0.113	0.4147	0.5494	12.14	112
14	2.35-3.00	0.0006	0.0012	0.0018	0.0065	0.0093	0.0061	0.0073	0.0943	0.4447	0.5712	13.91	112
Σ	9.00-3.00 a.m p.m	0.0038	0.0089	0.0266	0.039	0.0761	0.1018	0.1498	0.7355	6.1154	7.3971	154.36	112.5
OSHA Level		$\overline{SPL}$ - 114.40 dBA											
		Mean - 113.82 dBA											
		Std. dev. - 0.012 dBA											

Note: Different length of holes, additional anchoring.

non-regularity of drilling were the causes for lower L_{eq}.

Second measurements were made with more regularity (Table 7.9). Results from Table 7.8 can be compared with results from Table 7.9:

$$\frac{215.611 - (14.394 + 15.925)}{7} = 26.5 \text{ min.}$$

From Table 7.9, No. 1. (time) = 14.394 min. and No. 2. (time) = 15.925 min; Number of sets = 7.

From Table 7.5 the time of one set of measurements was 26.6 min. Both results are equal but their L_{eq} differ by 1.7 dBA.

Drilling data from Table 7.9 was obtained in a drift, where reverberation is high, and sound levels are higher by 1 dBA to 2 dBA. Noise from the 630 Stope Jumbo is intermittent in nature (Figure 7.5).

At the start of a working day, the 630 Stope Jumbo was out of order. While waiting for a service vehicle, the Jumbo operator was exposed to noise emitted mainly by a scooptram and other mining vehicles (Figure 7.6). Distance from the vehicle passage is 50 ft. Twenty-six times different vehicles passed the 44 FW Stope. Noise exposure index and other noise data from vehicles are:

E.I.	= 0.028
T. Time	= 5.916 min.
L_{eq}	= 96.1 dBA
$\overline{SPL}$	= 95.59 dBA
Mean	= 95.04 dBA
Std. Dev.	= 0.026 dBA

Influence on the accumulative noise exposure index is trivial. Noise energy from vehicles has a dominant frequency below 250 Hz. For

TABLE 7.9

Noise Exposure Index Evaluations Related to Set Observations, 44 W Stope, 1400 Level, November 11th, 1975

No.	Time (h)	OSHA - Noise Exposure Index										T. Time (Min.)	L_{eq} (dBA)	No. of Holes*
		90 dBA	92 dBA	95 dBA	97 dBA	100 dBA	102 dBA	105 dBA	110 dBA	115 dBA	Σ			
1	a.m. 8.00-9.05	0	0	0.0007	0	0.0035	0.0012	0	0.0053	0.9018	0.9125	14.394	114.2	1
2	9.05-9.20	0.0013	0.0005	0.0014	0.0039	0.0067	0.0005	0.0075	0.0275	0.7933	0.8426	15.925	113.5	1
3	10.45-11.05	0	0.0011	0.0017	0.0020	0.0062	0.0086	0	0.0222	1.265	1.3065	22.337	114.1	2
4	11.05-11.25	0	0.0001	0.0002	0.0006	0.0025	0	0	0.0241	1.1685	1.1960	18.77	114.8	2
5	p.m. 12.17-12.43	0	0.0005	0.0014	0.0015	0.0023	0.0018	0.0017	0.0441	1.2581	1.3114	21.516	114.1	2
6	12.43-1.15	0	0	0.0037	0	0.0162	0.0017	0.0018	0.0203	1.8037	1.8474	30.764	114.1	2
7	1.15-1.43	0.0002	0.0003	0.0004	0.0031	0	0.0012	0.0009	0.0333	1.7018	1.7412	27.58	114.9	2
8	1.43-2.13	0	0.0008	0.0092	0.0009	0.0018	0.0028	0	0.1176	1.5258	1.6589	29.554	114	2
9	2.13-2.50	0.0010	0.0010	0.0042	0.0040	0.0053	0	0	0.1601	1.7831	1.9587	34.771	113.9	2
Σ		0.0025	0.0043	0.0229	0.016	0.0445	0.0178	0.0119	0.4545	12.2011	12.7752	215.61	114.3	16

dBA	OSHA Levels	
$\overline{SPL}$	114.40	113.47
Mean	113.11	112.12
Std. Dev.	0.0113	0.011

* Hole / 14 Feet.

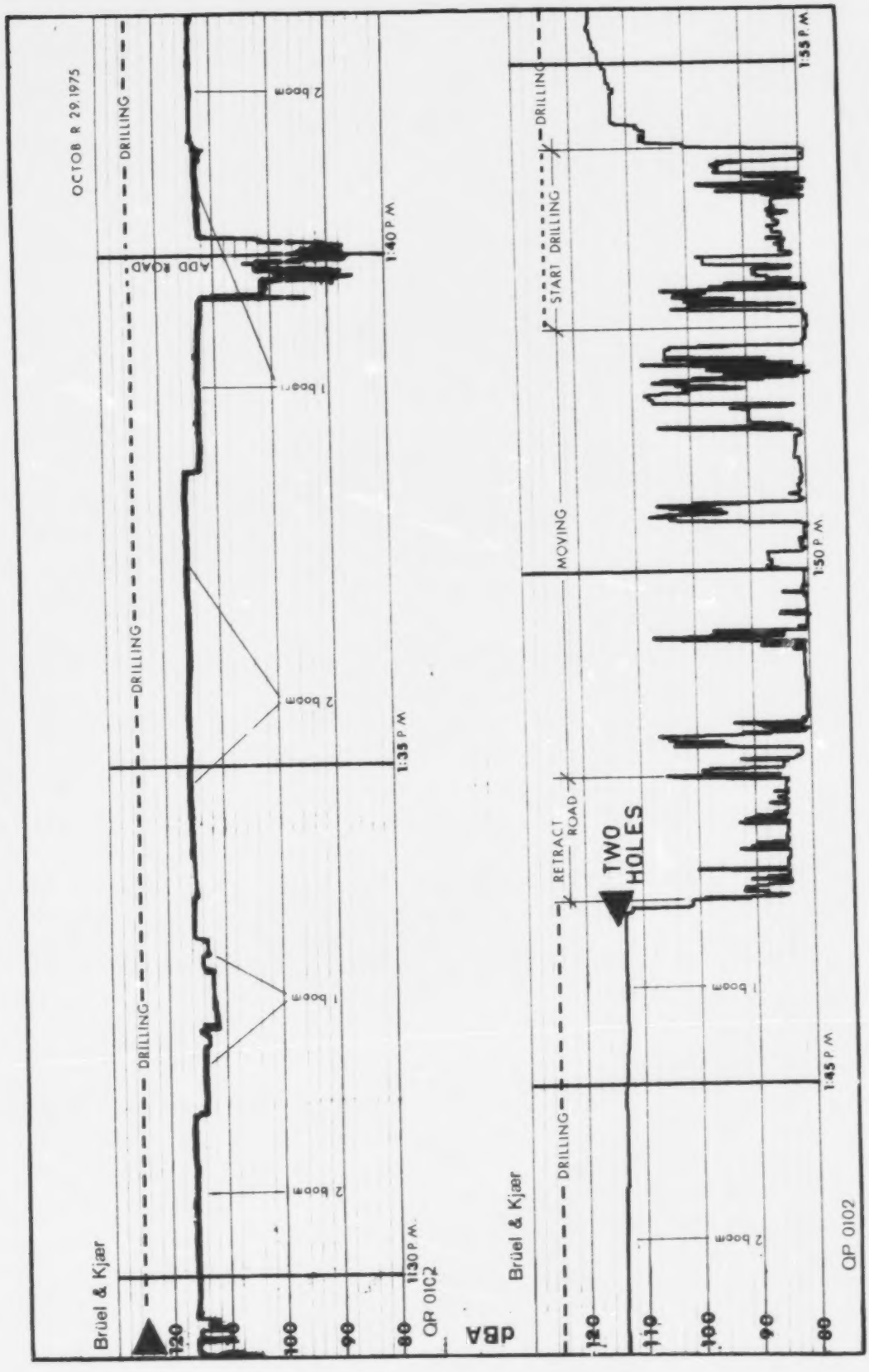


Figure 7.5: Typical Recorder Intermittent Noise Trace of 630 Stope Jumbo, Two Drills BBC 100 F.

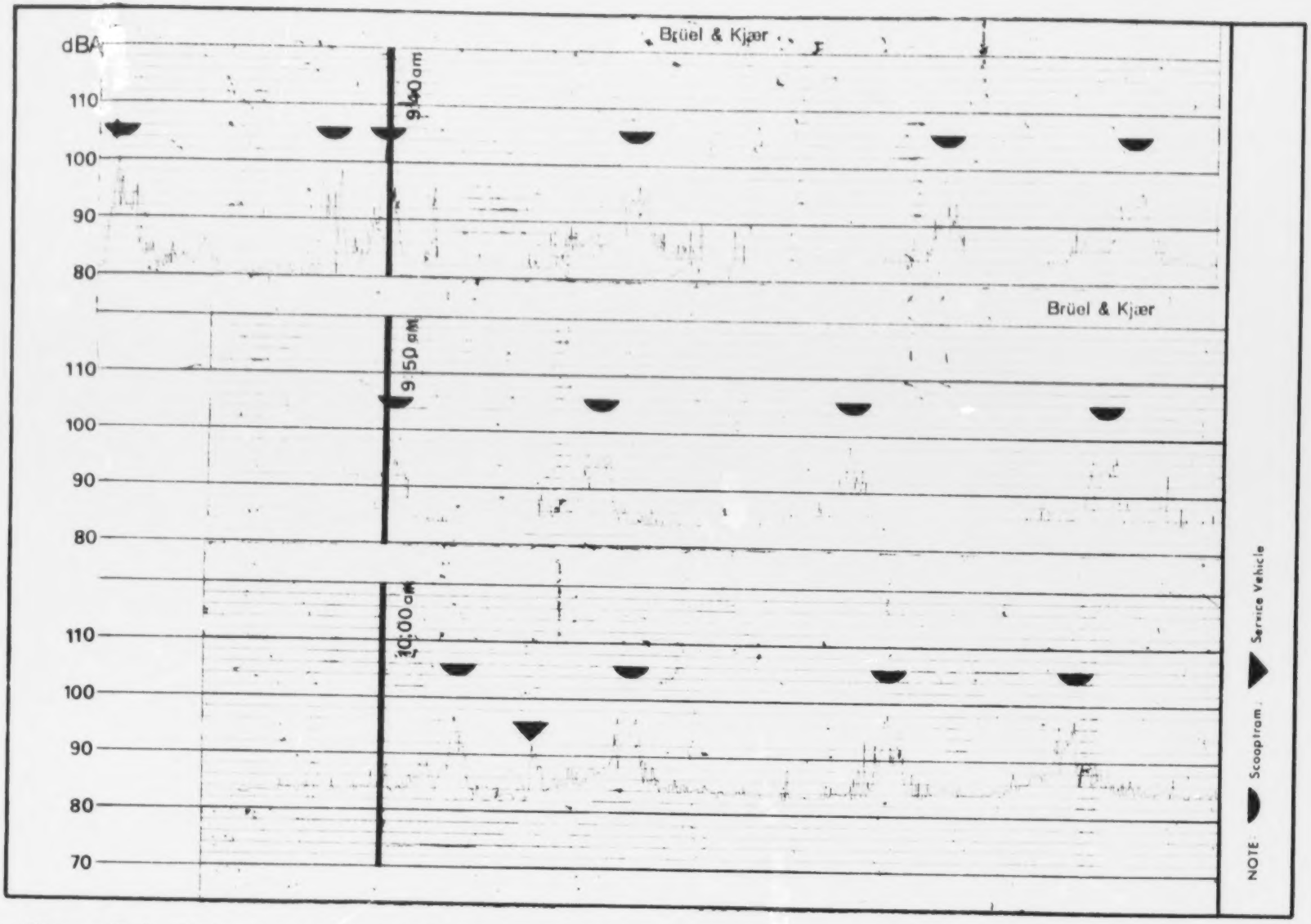


Figure 7.6: Noise Levels from Vehicles to which the 630 Stope Jumbo Operator was Exposed to on 44 FW Stope, 1400 Level.

these reasons the noise impressions were vigorous. Figure 7.7 shows a noise data comparison under different mining conditions. The influence of reflection is quite high.

The 630 Stope Jumbo produces a very high noise level. Results from Noise Rating Numbers -N(P) with an ear protector are 92 dBA, 91 dBA and 86 dBA (Figure 7.7). This shows that wearing ear-muffs alone is not good enough and that one must wear ear-muffs and ear-plugs (Table 7.10).

TABLE 7.10

Permitted Noise Duration of 630 Stope Jumbo

No.	Job Category	N* dBA	Exposure Limit		Note
			Without Ear Muff	With Ear Muff	
1	Operator	123	3.75 (min.)	6 h	From Figure 7
2	Helper +	123	3.75 (min.)	6 h	From Figure 7

* N is Noise Rating Number.

\+ Approximately the same as the operator.

Graphical methods of estimating noise impacts are used to predict theoretical efficiency of ear protectors.

7.5 Jumbos, Three Drills

Jarvis Clark MJM-21 three boom jumbo is a four wheel drive, centre articulated carrier powered by a Deutz engine of 78 h.p. (30). It is equipped with three ES-300 Tampella Drills.

Three measurements were performed on this machine, at the same time (Table 7.11). The first surveyor used the standard method of measuring and evaluating. After one hour of measurement, the second surveyor saw

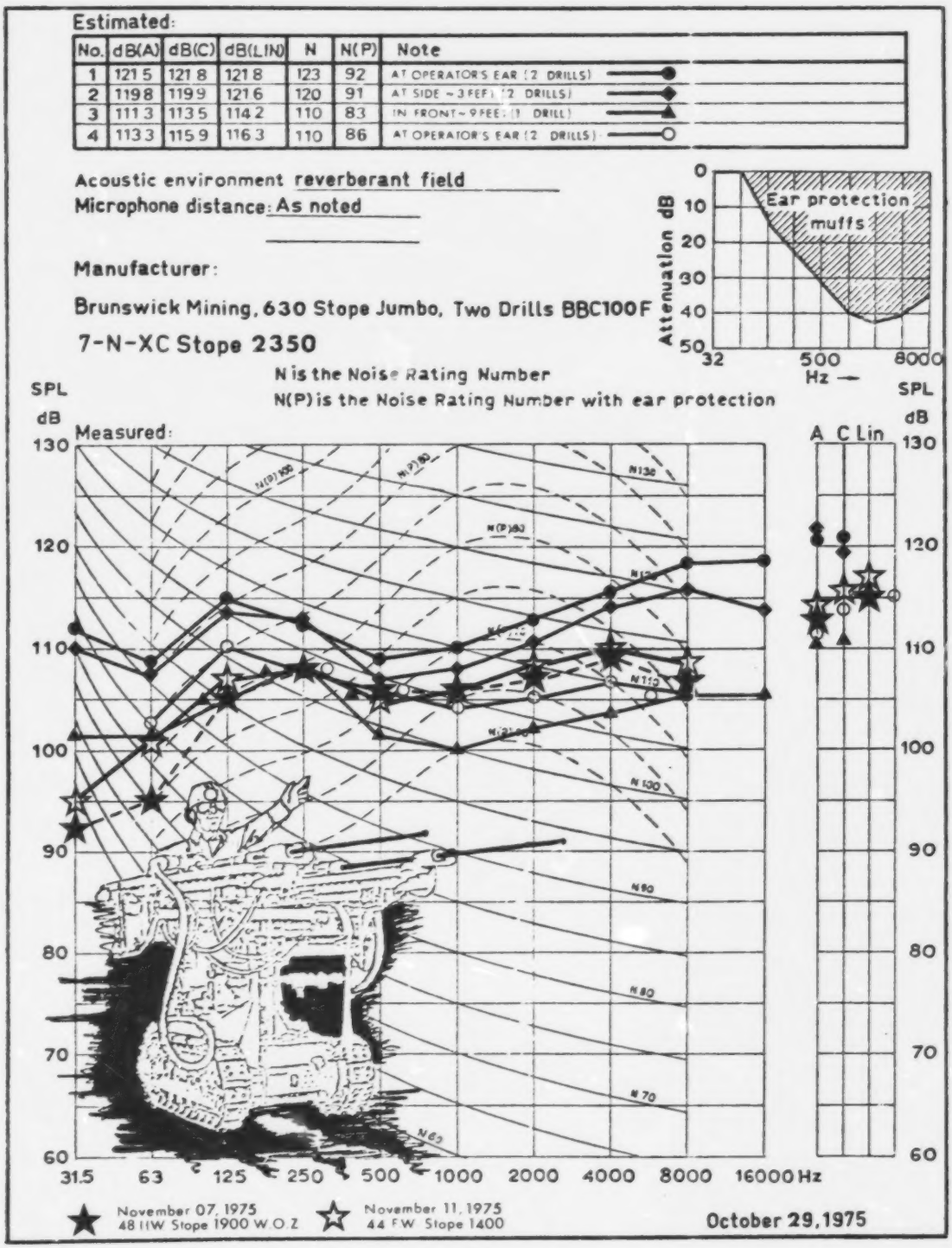
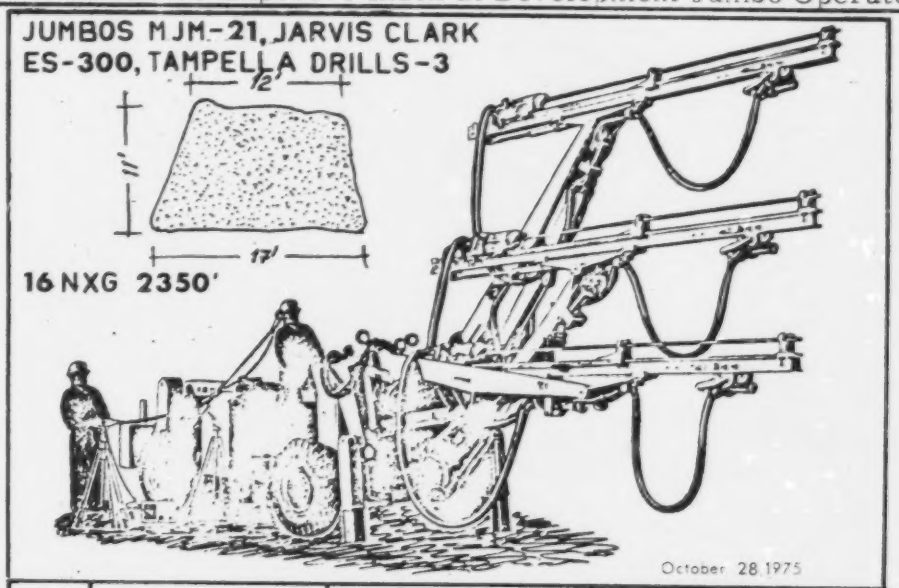

Estimated:
No. dB(A) dB(C) dB(LIN) N N(P) Note
1 121 5 121 8 121 8 123 92 AT OPERATOR'S EAR (2 DRILLS)
2 119 8 119 9 121 6 120 91 AT SIDE ~ 3 FEET (2 DRILLS)
3 111 3 113 5 114 2 110 83 IN FRONT ~ 9 FEET (1 DRILL)
4 113 3 115 9 116 3 110 86 AT OPERATOR'S EAR (2 DRILLS)
Acoustic environment reverberant field
Microphone distance: As noted
Manufacturer:
Brunswick Mining, 630 Stope Jumbo, Two Drills BBC100F
7-N-XC Stope 2350
Attenuation dB
Ear protection muffs
Hz
N is the Noise Rating Number
N(P) is the Noise Rating Number with ear protection
SPL dB
Measured:
A C Lin
31.5 63 125 250 500 1000 2000 4000 8000 16000 Hz
November 07, 1975
48 IIW Stope 1900 W O Z
November 11, 1975
44 F.W. Stope 1400
October 29, 1975

Figure 7.7: Comparison of Octave Band Noise Data under different Mining Conditions.

TABLE 7.11

Measurement of Noise Exposure Index at Development Jumbo Operator's Ear



	1 Sound Level Meter Type 2205, B & K and Stop Watch			2 1933 Precision Sound Level Meter, Gen-Rad and Stop Watch*			3 Impulse Precision Sound Level Meter Type 2209, B&K, and Level Recorder Type 2306, B & K		
dBA Max Level	C†	T††	C/T	C	T	C/T	C	T	C/T
>115	1.423	None	∞	1.8776	None	∞	1.082	None	∞
115	1.875	¼	7.50	2.0836	¼	8.334	2.148	¼	8.59
110	0.107	½	0.214	0.2332	½	0.466	0.144	½	0.288
105		1			1			1	
102		1½			1½			1½	
100		2			2			2	
97	0.103	3	0.034		3		0.067	3	0.02
95	0.060	4	0.015		4		0.047	4	0.01
92	0.103	6	0.017	0.2	6	0.033	0.105	6	0.02
90	0.017	8	0.002		8			8	
Total	3.688		7.78+∞	4.394		8.83+∞	3.593		8.93+∞
Maxim	118			116			119.5		
$\overline{SPL}$•	114.82			114.96			114.19		
Mean	113.29			113.834			113.191		
Std. Dev	0.05			0.0454			0.083		

Note: Maximum Levels as measured on the "A_s" scale of the sound level meter. If the reading is between levels specified, use the higher level.

*Exposure measured for 1 hour period. Values multiplied by 4 to extrapolate for a normal 4 to 4½ hour day of drilling.

†Total duration in hours per day.

††Permissible hours per day.

•Average $\overline{SPL} = 10 \text{ Log } \frac{1}{n} (\text{antilog } \frac{SPL_1}{10} + \text{antilog } \frac{SPL_2}{10} + \text{----- } + \text{antilog } \frac{SPL_n}{10})$

Surveyor	Instruments	Description
1st	Sound Level Meter Type 2205, B & K and Stop Watch.	Without practice and without theoretical experience.
2nd	1933 Precision Sound Level Meter, Gen Rad and Stop Watch	Without practice and with theoretical experience.
3rd	Impulse Precision Sound Level Meter Type 2209, B & K, and Level Recorder Type 2306, B & K.	With practice and with theoretical experience.

that noise varied between 110 - 116 dBA. On the basis of the hour's measurements, he calculated the noise exposure index (Table 7.11). The 3rd surveyor executed his measurements for the entire shift.

From Table 7.11 it is quite evident that three groups of noise exist:

1. 90 - 97 dBA, have no major influence on the noise exposure index.
2. 110 - 115 dBA, have a major influence on the noise exposure index.
3. 115 - 120 dBA, over the OSHA permissible level.

Thus we have a new Table 7.12.

TABLE 7.12

Noise Exposure Index of the Jumbo (ES-300) Operator Including Intervals from 115 dBA to 120 dBA*

	1	2	3	Dosimeter Table 3.3, No. 24
E.I.	19.164	23.851	17.59	14.53
Time (h)	3.688	4.394	3.593	3.593+
L_{eq} (dBA)	117	117	116.1	115

* In the 115 - 120 dBA interval, an exposure of 1/8 hours per day is permissible.

\+ Time from Level Recorder.

The second surveyor's results were not that good. After one hour of measuring, he multiplied his results by 4.3 hours per day of drilling. The results would have been correct had the calculations been done in correspondence to the number of holes.

The Jumbo operator drilled the following:

Diameter (in.)	No. of Holes	Length (Ft.)	Σ (Ft.)
$1\frac{1}{2}$	55	12	660
3	3	12	36
			696

This work was completed in 3.593 hours, and the noise exposure index was 17.59. Thus, penetration is 3.23 Ft/min. In the same manner we can calculate noise exposure index. It is a simple matter of multiplying and dividing.

In Table 7.12, the correct results of the 3rd surveyor were used because of the following reasons:

1. The operator's noise exposure index was evaluated from his histogram;
2. The microphone was near the operator's ears and it was constantly controlled;
3. $L_{eq} \approx \overline{SPL}$ from Table 7.13, under the condition that all three rock drills were constantly working.

Noise dosimeter results in Table 3.3, No. 24 are also good because L_{eq} = 115 dBA (Table 7.12).

In drilling, 2 or 3 drills are always working:

TABLE 7.13

Comparisons of Noise from Drills by Jarvis Clark Jumbos

No. of Drills	No. of Samples	dBA				
		Min.	Max.	$\overline{SPL}$*	Mean	Std. Dev.
1	14	110	116	113.1	112.86	0.4
2	43	110	116	114.66	114.56	0.16
3	40	113	118	116.06	115.97	0.14

* Average $\overline{SPL} = 10 \log \frac{1}{n} (\text{antilog} \frac{SPL_1}{10} + \text{-----+ antilog} \frac{SPL_2}{10})$

Two drills Noise dosimeter Three drills

$(L_{eq_{(2)}} = 114.66 \text{ dBA}) < (L_{eq(D)} = 115 \text{ dBA}) < (L_{eq(3)} = 116.06 \text{ dBA})$

In our calculations we used high safety factors, and thus I do not think that our results are incorrect.

October 31st, 1975, the development Jumbo, (Jarvis Clark) was in the drift on the 2350 ft. level. Drilling started at 8.49 a.m. and ended at 9.53 a.m.

From 348 samples, the average $\overline{SPL}$ and mean were calculated:

$\overline{SPL}$ = 116.39 dBA

Mean = 115.27 dBA

Std. Dev. = 0.07 dBA

The Jumbo helper's evaluation was not carried out, because the noise dosimeter did not give a result (Table 3.3, No. 25). The level of noise under the muff was very high, L_{eq} = 105.5 dBA. The operator's noise level under the muff was significantly higher, L_{eq} = 112.4 dBA, (Table 3.3, No. 24). The values cannot be compared, because we do not know the working efficiency of the ear muffs (those on the operator and helper).

7.5.1 Noise Exposure of Operator and Helper from the Development Jumbo

On the basis of obtained results, it is evident that the noise levels are high, and that ear muffs do not offer adequate protection. This is why the ear muffs and the ear plugs should be used.

The theoretical graphical analysis from Figure 7.8 shows that the Noise Rating Number with ear protectors, hovers around 85 dBA. This is a sign that permanent audiometric tests (OSHA) should be performed on this group of workers. Measurement No. 2 in Figure 7.8 at 63 Hz should be looked upon as incidental because the result is unreal.

Table 7.14 was completed from noise exposure index results. Practice and theory differ widely. There are over 175 earplugs and earmuffs on the market today, and the question is: how are they best applied and what is the best method of teaching the miners to use them correctly (31).

The MJM-21 three boom pneumatic Jumbo has as optional equipment a sound proof cab (Model MJM-21A), but enclosures are not the only answer (32).

Vignette

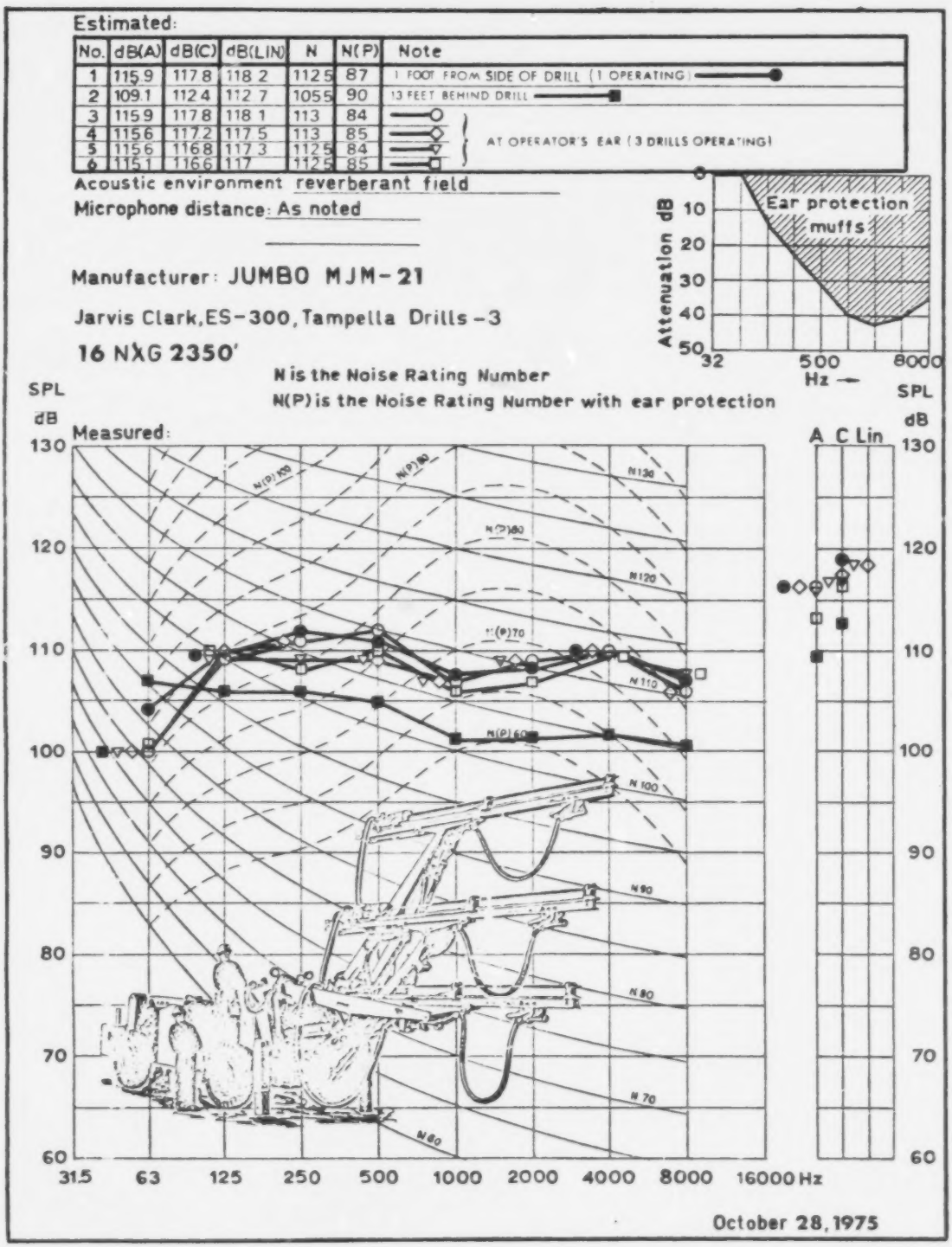


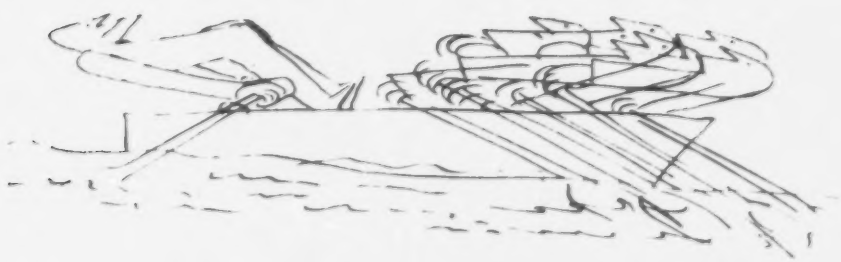
Figure 7.8: Sound Pressure Level Spectral Analysis of Noise from Development Jumbo.

TABLE 7.14

Permitted Duration of Noise in Development Jumbo in Practice and in Theory

In Practice					
No.	Job Category	Without Ear Muff		With Ear Muff	
		L_{eq} (dBA)	Exposure Limit (min.)	L_{eq} (dBA)	Exposure Limit (min.)
1	Operator	116.1	Not permitted	112.4	22
2	Helper	116.1*	Not permitted	105.5	56
* L_{eq} (operator) = L_{eq} (helper)					

In Theory					
No.	Job Category	N*	Exposure Limits (min.)		Note
			Without Ear Muff	With Ear Muff	
1	Operator	113.5	18.5	No limit	From Figure 7.8
2	Helper	113.5	18.5	No limit	Figure 7.8
* N is the Noise Rating Number.					



Vignette

7.6 Diamond Drilling

Diamond Drilling is a profession which has applications in all Canada, but the Diamond Drilling Industry has ties mainly with western Canada. Diamond Drilling involves the removal of core samples of rock using power drills with diamond bits.

During the Second World War, Boyles Bros. manufacturing division of Vancouver held the contract to supply diamond drills to various Allied army engineering corps. Technological advances made during the war inspired the development of more sophisticated machines, which helped Boyles to assume supremacy in Canada during the 1950's and 60's (33).

During the 1950's Boyles Bros. continued their development and increased exports on foreign markets. In 1956, the company changed its status from a private to a public company. A branch was also established at Moncton, New Brunswick. By 1961, the company was reporting gross revenues of $7 million from manufacturing and contracting.

On this Canadian product several measurements were performed in the No. 12 Mine to contribute a better understanding and also to contribute in the development of noise abatement.

Boyles VEG Diamond Drill has compact construction and is a motored version of the JV Lightweight Model. It can be speedily dismantled into two units. Two drill pumps are available: 5 - 12 and 4 - 7 models. Capacities are 400 to 1, 200 g. p. h. (34).

Three of these machines were monitored in the mine.

7.6.1 Noise Measurement at the HW Exhaust Drift, 2350 Level.

Noise was observed by two surveyors (Figure 7.9):

- From 9.05 a.m. to 3.07 p.m. with Impulse Precision Sound Level Meter Type 2209, B & K, and Level Recorder Type 2306, B & K; and
- From 9.05 a.m. to 11.25 p.m. with Sound Level Meter Type 2205, B & K, and Stop Watch.

From the measured data noise exposure histograms of the diamond driller were plotted (Figure 7.9). The accuracy control of these two measurements is L_{eq}. The second surveyor's result is higher, 105 dBA - 104.1 dBA $\approx$ 1 dBA. "If the reading is between levels specified, use the higher level," recommended OSHA. For this reason a young observer, without experience, will read higher results. A noise at 115 dBA was emitted by the machine in the afternoon, because the muffler was removed.

The first surveyor determined the exposure index graphically (Figure 7.9) and by adding the effects of each operation (set) from the diamond driller's shift histogram (Figure 7.10). From Figure 7.10 the exposure index and L_{eq} also evaluated numerically by a standard method for each set of operations (Table 7.15). One set of operations belongs to 10 ft. of hole. In the morning hours L_{eq} was 103.3 dBA (Table 7.15). At 11.00 a.m. air pressure is low, and for this we have L_{eq} = 101 dBA. Cycles of sets of operations are repeated and differences in the exposure index are a function of rock hardness. The noise exposure index measured with a noise dosimeter is in discordance with results from Table 7.15 and

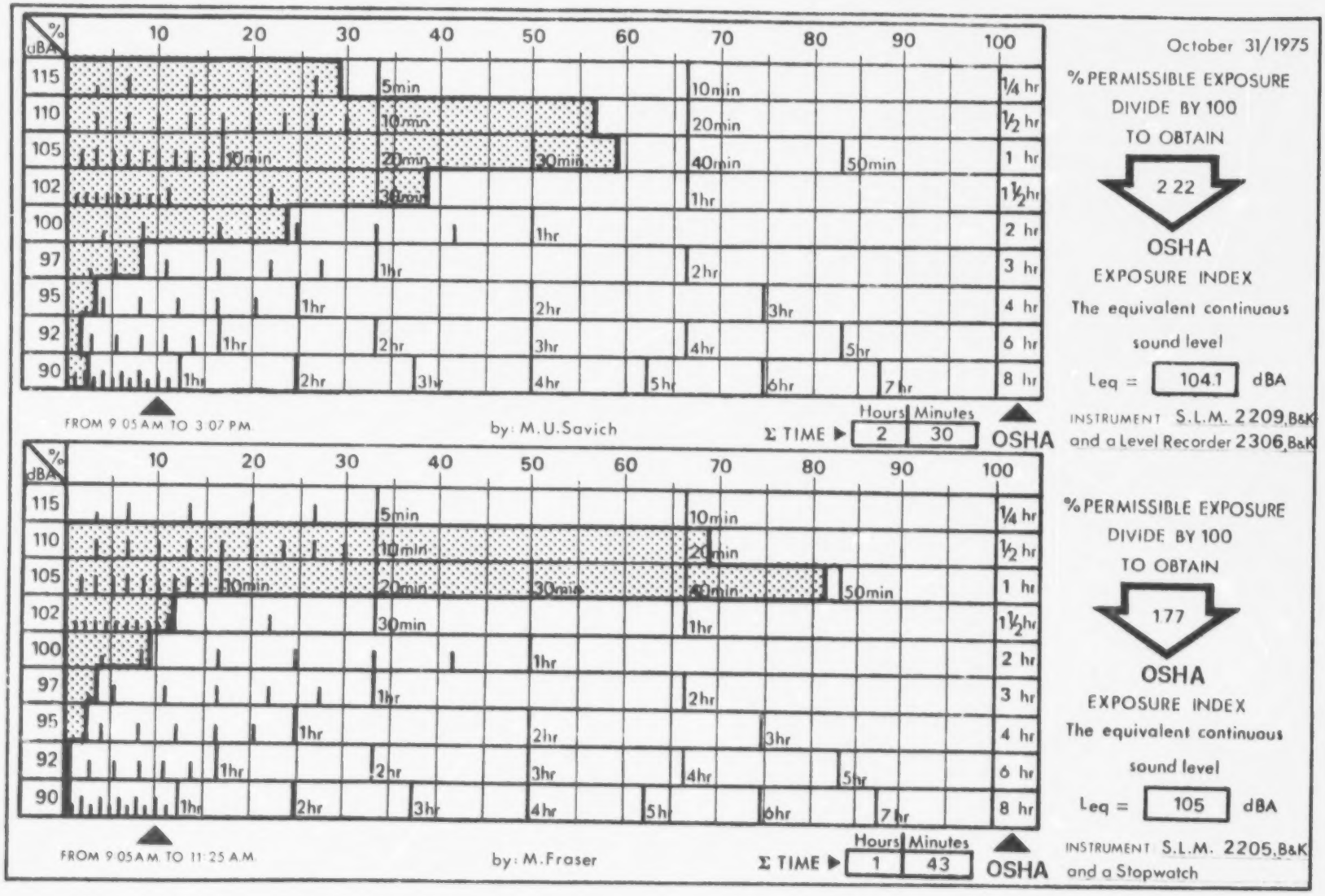

% dBA
10 20 30 40 50 60 70 80 90 100
115 110 105 102 100 97 95 92 90
5min 10min 20min 30min 40min 50min 1hr 2hr 3hr 4hr 5hr 6hr 7hr
¼ hr ½ hr 1 hr 1½hr 2 hr 3 hr 4 hr 6 hr 8 hr
FROM 9:05 A.M. TO 3:07 P.M.
by: M.U.Savich
Σ TIME ▶ Hours 2 Minutes 30
OSHA
October 31/1975
% PERMISSIBLE EXPOSURE
DIVIDE BY 100
TO OBTAIN
2.22
OSHA
EXPOSURE INDEX
The equivalent continuous sound level
Leq = 104.1 dBA
INSTRUMENT S.L.M. 2209, B&K and a Level Recorder 2306, B&K
FROM 9:05 A.M. TO 11:25 A.M.
by: M.Fraser
Σ TIME ▶ Hours 1 Minutes 43
OSHA
% PERMISSIBLE EXPOSURE
DIVIDE BY 100
TO OBTAIN
1.77
OSHA
EXPOSURE INDEX
The equivalent continuous sound level
Leq = 105 dBA
INSTRUMENT S.L.M. 2205, B&K and a Stopwatch

Figure 7.9: Diamond Driller Noise Exposure Histograms.
Drilling Machine: Boyles VEG Diamond Drill at the HW Exhaust Drift, 2350 Level.

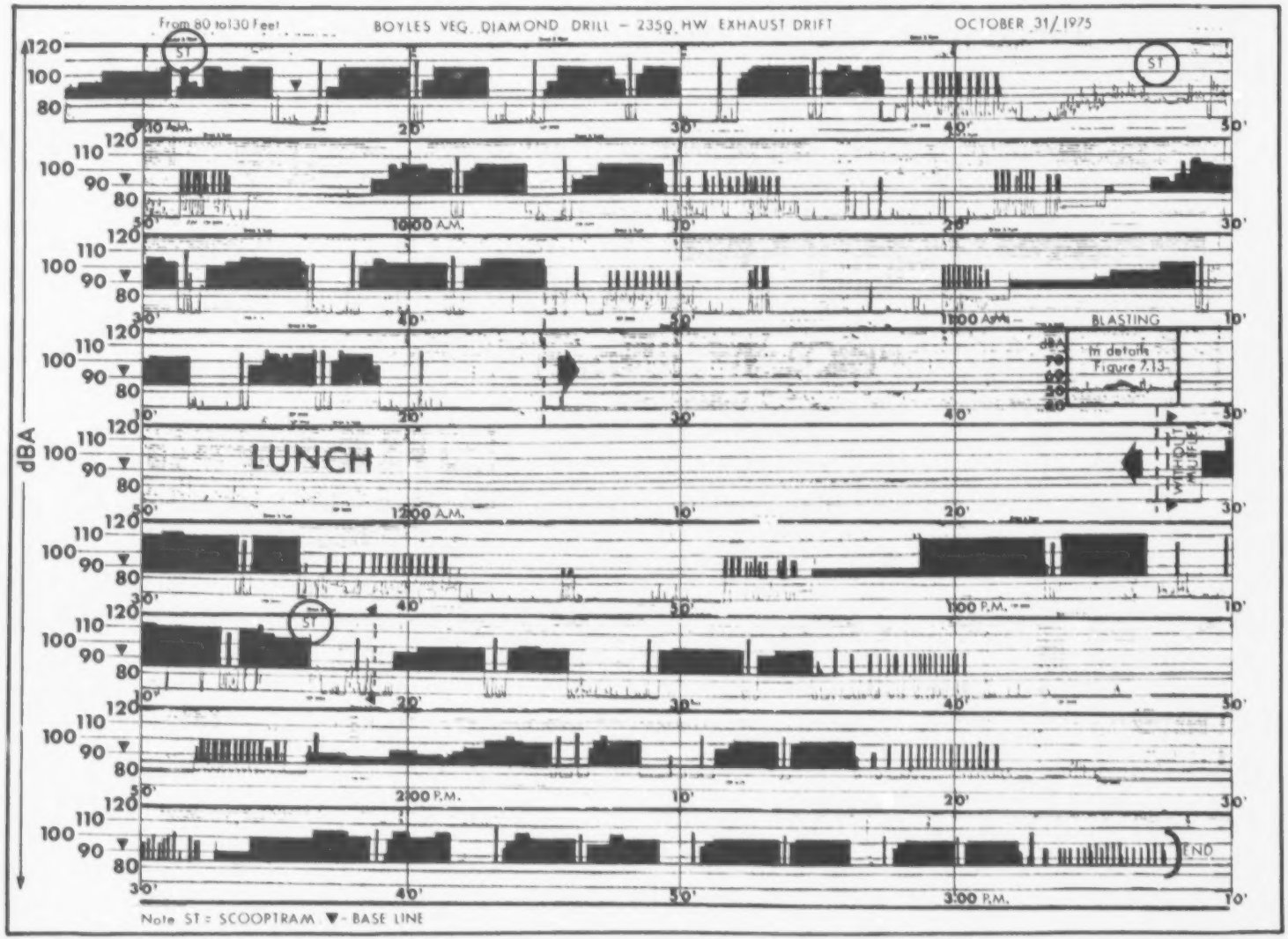


Figure 7.10: Diamond Driller Shift Histogram.

TABLE 7.15

The Noise Exposure Index and Equivalent Continuous Sound Level by Adding the Effects of Each Set of Operations

No.	Depth in Ft.	OSHA - Noise Exposure Index										T. Time (Min.)	L_{eq} (dBA)
		90 dBA	92 dBA	95 dBA	97 dBA	100 dBA	102 dBA	105 dBA	110 dBA	115 dBA	Σ		
1	80-90	0.0002	0.0038	0.0081	0.0056	0.0143	0.0456	0.2313	0.0241	0	0.333	24.9	103.3
2	90-92.5	0.0002	0.0005	0.0039	0.0093	0.0139	0.0142	0.0925	0.013	0	0.1475	11.8	103.3
3	92.5-97.5	0	0.0006	0.0035	0.0106	0.031	0.0444	0.1064	0.0222	0	0.2187	17.7	103.3
4	9.75-102.5	0.0067	0.0015	0	0.0154	0.0176	0.0327	0.0435	0.0185	0	0.1359	14.8	101
5*	102.5-105	0.0004	0.0004	0.0062	0	0	0.0093	0	0.1684	0.0718	0.2365	7.7	109.2
6*	105-110	0.0043	0.0063	0	0.0040	0.0051	0	0.0268	0.2794	0.2405	0.5664	19.3	109.2
7	110-115	0	0.0002	0	0.0173	0.0698	0.0099	0	0.0111	0	0.1083	12.8	100
8	115-120	0.0038	0.0072	0.0081	0.0083	0.0481	0.0697	0.0176	0.0028	0	0.1656	21.1	100
9	120-130	0.0029	0.0005	0.0025	0.0151	0.0388	0.1517	0.0675	0.0148	0	0.2938	27.7	101.3
	80-130	0.0185	0.021	0.0323	0.0856	0.2386	0.3775	0.5856	0.5543	0.2923	2.2057	157.8	104

* Without Muffler

and Table 3.3, No. 28.

During lunch time, the background and blasting noise were observed. The background noise was 50 dBA. A higher level of stope blasting was at 11.46 a.m. (Figure 7.10 and 7.11).

The required time for blasting was 1.36 min. The increase of noise was 1 to 3 dBA, but the psychological effect was painful. The author remembers this time of blasting in detail to this day. In this case the blasting noise was transformed into vibration, and vibration into noise. In the world literature this phenomenon has been well treated.

At the same time, the noise emitted by a drop of water was observed. The microphone distance from the place where water dripped was 0.5 m. The annoyance after 15 min. was very high. If a background noise level of 10 to 15 dBA would occur, the effects will be greater. This effect one

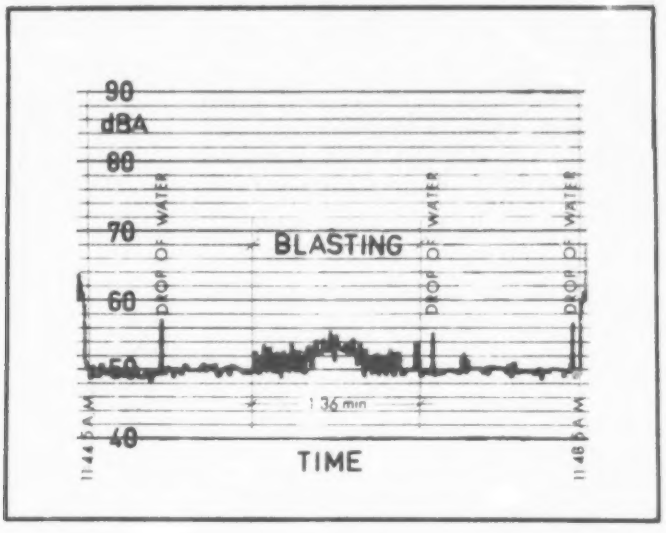


Figure 7.11: Blasting during Lunch Time Observation on 2350 Level, HW Exhaust Drift.

experiences in a house during night time: a background noise falls to the lowest level and drops awaken people from sleep. These conventional descriptions might not provide a complete characterization of the annoyance potential of noise in this instance. In wet mines, this effect should be taken into consideration, especially during times of accidents.

Immediately after lunch, a muffler from the exhaust pipe was removed, and the noise level increased rapidly (Table 7.15, No. 5 and 6). From Table 7.15 L_{eq} with muffler is 102 dBA, and L_{eq} without muffler is 109.2 dBA. A comparison of all frequency noise, from unmuffled and muffled machines was made (Figure 7.12). The difference is high, 7 dBA, but the price of a muffler is low, less than $10.00. This example taught us that PVC materials should be given priority in construction of mufflers.

On November 6th, 1975, three measurements with a hand-held meter were taken at 2350 HW exhaust drift (Figure 7.13). Results show coincidence with future octave band analyses on the same machine.

7.6.2 Noise Measurement at F-IN Drift, 1900 Level

The noise exposure index, and the equivalent continuous sound level on a diamond driller was evaluated with the standard and graphical methods (Figure 7.14). In Figure 7.14 full information about measurements, evaluations and results can be found. L_{eq} is higher because the machine has no muffler. A longer exhaust pipe attenuated noise, but the job was not good enough. The diamond driller noise histogram (Figure 7.14) shows separate maximums of 99 dBA and 103 dBA.

The first maximum was caused by the reset chuck. This maximum

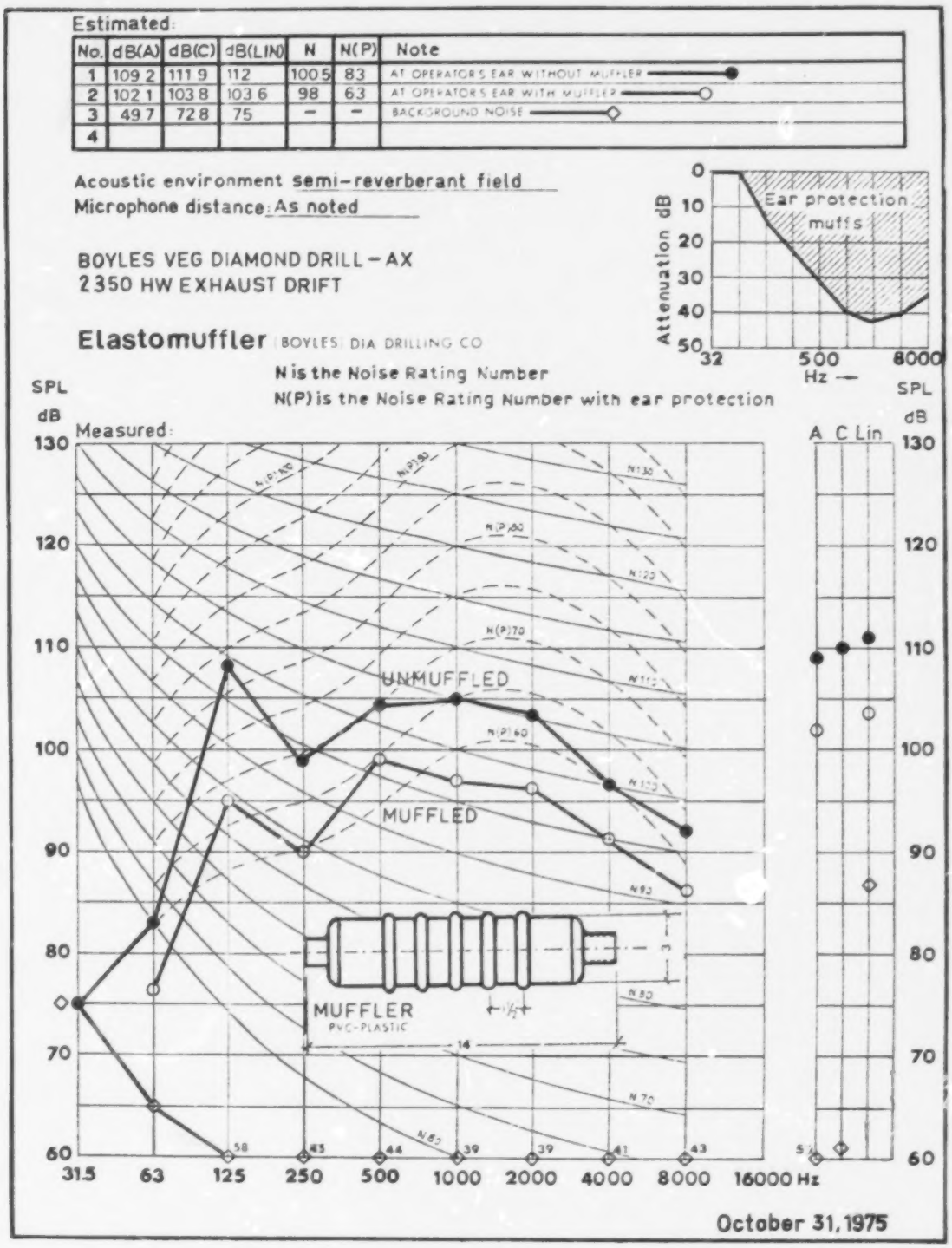

Estimated:
No. dB(A) dB(C) dB(LIN) N N(P) Note
1 109 2 111 9 112 100 5 83 AT OPERATOR'S EAR WITHOUT MUFFLER
2 102 1 103 8 103 6 98 63 AT OPERATOR'S EAR WITH MUFFLER
3 49 7 72 8 75 – – BACKGROUND NOISE
4
Acoustic environment semi-reverberant field
Microphone distance: As noted
BOYLES VEG DIAMOND DRILL – AX
2350 HW EXHAUST DRIFT
Elastomuffler (BOYLES) DIA DRILLING CO
N is the Noise Rating Number
N(P) is the Noise Rating Number with ear protection
Attenuation dB
Ear protection muffs
Hz
SPL dB
Measured:
UNMUFFLED
MUFFLED
MUFFLER
PVC-PLASTIC
A C Lin
315 63 125 250 500 1000 2000 4000 8000 16000 Hz
October 31, 1975

Figure 7.12: Comparison of Octave Band Noise Data between unmuffled and muffled Air Exhaust Pipe from Diamond Drill.

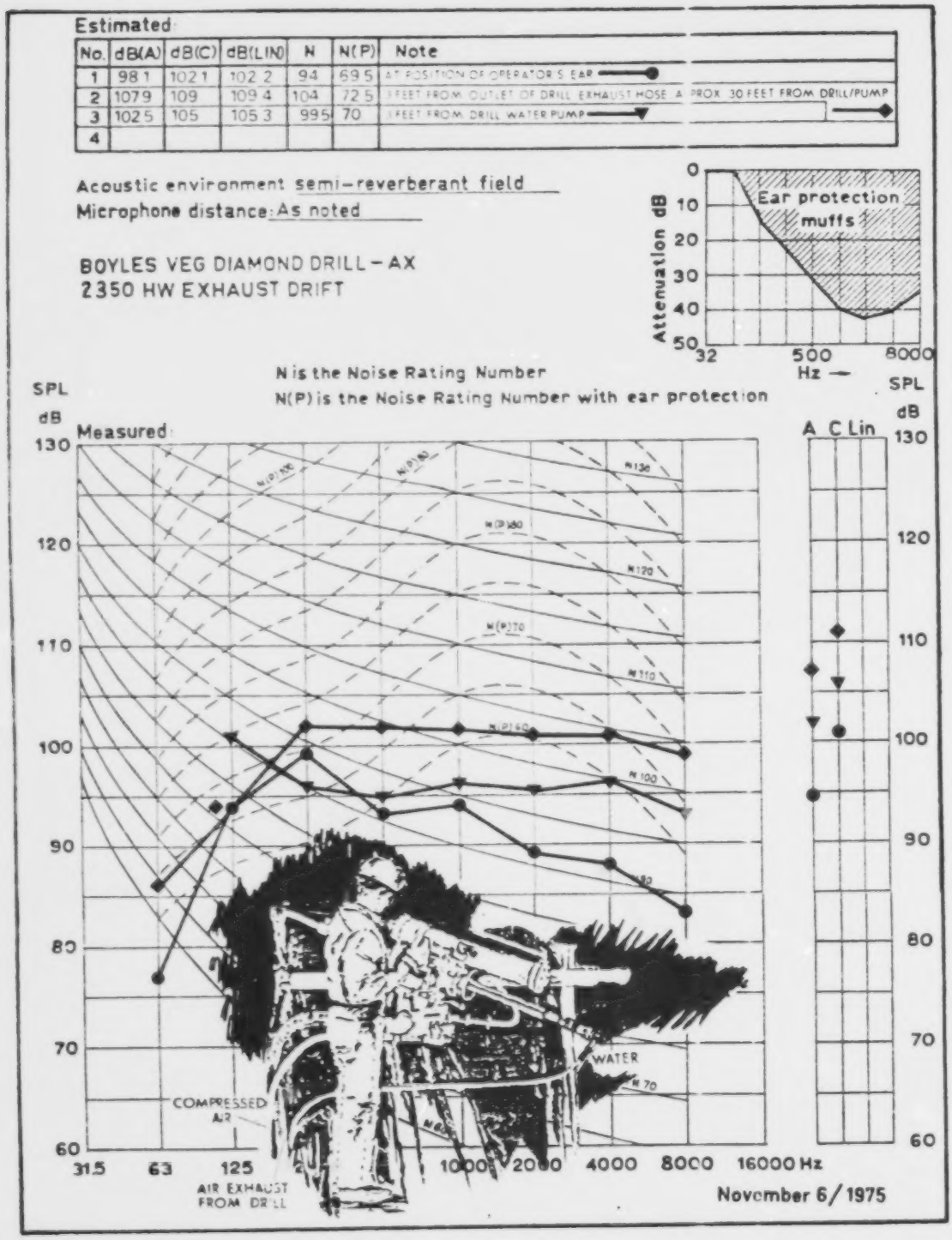


Figure 7.13: Octave Band Noise Data of Diamond Drilling Machine.

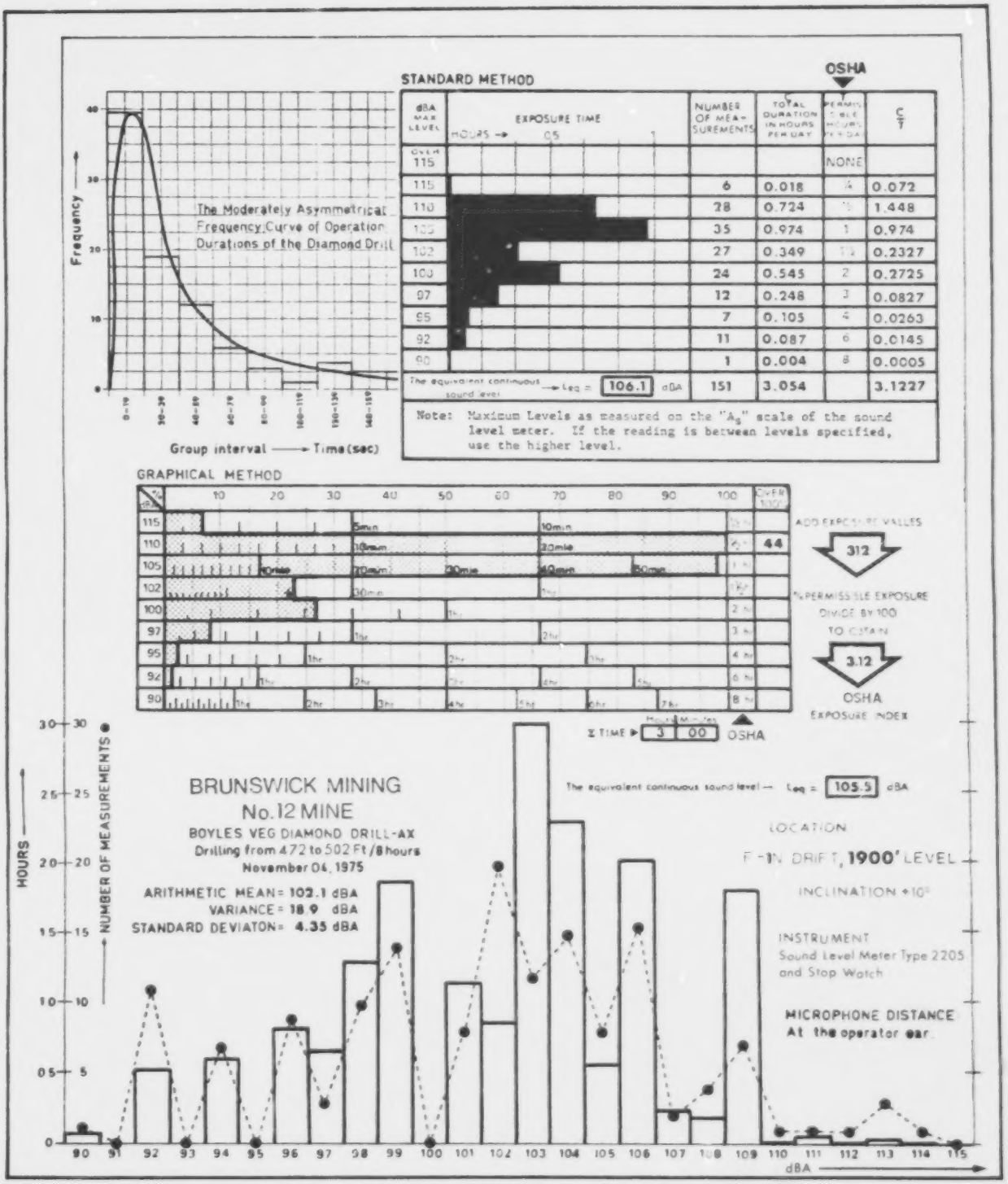

STANDARD METHOD
OSHA
The Moderately Asymmetrical Frequency Curve of Operation Durations of the Diamond Drill
Frequency
Group interval → Time (sec)
dBA MAX LEVEL
EXPOSURE TIME HOURS →
NUMBER OF MEASUREMENTS
TOTAL DURATION IN HOURS PER DAY
PERMISSIBLE HOURS PER DAY
C/T
OVER 115
NONE
115 6 0.018 4 0.072
110 28 0.724 2 1.448
105 35 0.974 1 0.974
102 27 0.349 1/2 0.2327
100 24 0.545 2 0.2725
97 12 0.248 3 0.0827
95 7 0.105 4 0.0263
92 11 0.087 6 0.0145
90 1 0.004 8 0.0005
The equivalent continuous sound level → Leq = 106.1 dBA
151 3.054 3.1227
Note: Maximum Levels as measured on the "A" scale of the sound level meter. If the reading is between levels specified, use the higher level.
GRAPHICAL METHOD
OVER 100%
44
ADD EXPOSURE VALUES
312
% PERMISSIBLE EXPOSURE
DIVIDE BY 100
TO OBTAIN
3.12
OSHA EXPOSURE INDEX
Σ TIME
3 00
OSHA
BRUNSWICK MINING
No. 12 MINE
BOYLES VEG DIAMOND DRILL-AX
Drilling from 472 to 502 Ft / 8 hours
November 04, 1975
ARITHMETIC MEAN = 102.1 dBA
VARIANCE = 18.9 dBA
STANDARD DEVIATON = 4.35 dBA
The equivalent continuous sound level — Leq = 105.5 dBA
LOCATION
F-IN DRIFT, 1900' LEVEL
INCLINATION +10°
INSTRUMENT
Sound Level Meter Type 2205 and Stop Watch
MICROPHONE DISTANCE
At the operator ear.
HOURS
NUMBER OF MEASUREMENTS
dBA

Figure 7.14: Diamond Driller's Noise Data.

will be repeated in all measurements. The moderately asymmetrical frequency curve of the diamond drill operation durations is very similar to the curve of other percussive drilling equipment.

The noise dosimeter result is in close agreement with performed measurements (Table 3.3, No. 29).

One more measurement was performed at the same place. The goal of this measurement was to obtain noise measurement data and work time analysis at the same time. Measurements from 8.30 a.m. to 11.30 a.m. showed full possibility of performing both observations at once without any effort (Figure 7.15). Evidence shows that it is possible to observe all work with high accuracy such as: inspection of pump, methane gas test, flush out cutting, drilling, reset chuck, rod counting (see retract rod at 9.50 a.m.), core removal, etc. In the laboratory, the noise exposure index and all the data for time study can be easily obtained from the time-history recordings made on a level recorder. Up to now nine sheets have been used for the time study (Appendix 3). With the new method evaluations will be simply done on one sheet. When first viewing this system it seems complicated, but after evaluation training and several measurements the simplicity will be evident.

The noise exposure index and L_{eq} were evaluated from the 8.35 a.m. to 11.30 a.m. time-history recording in Figure 7.15. The evaluation of this data in the various operations examined are given in Table 7.16.

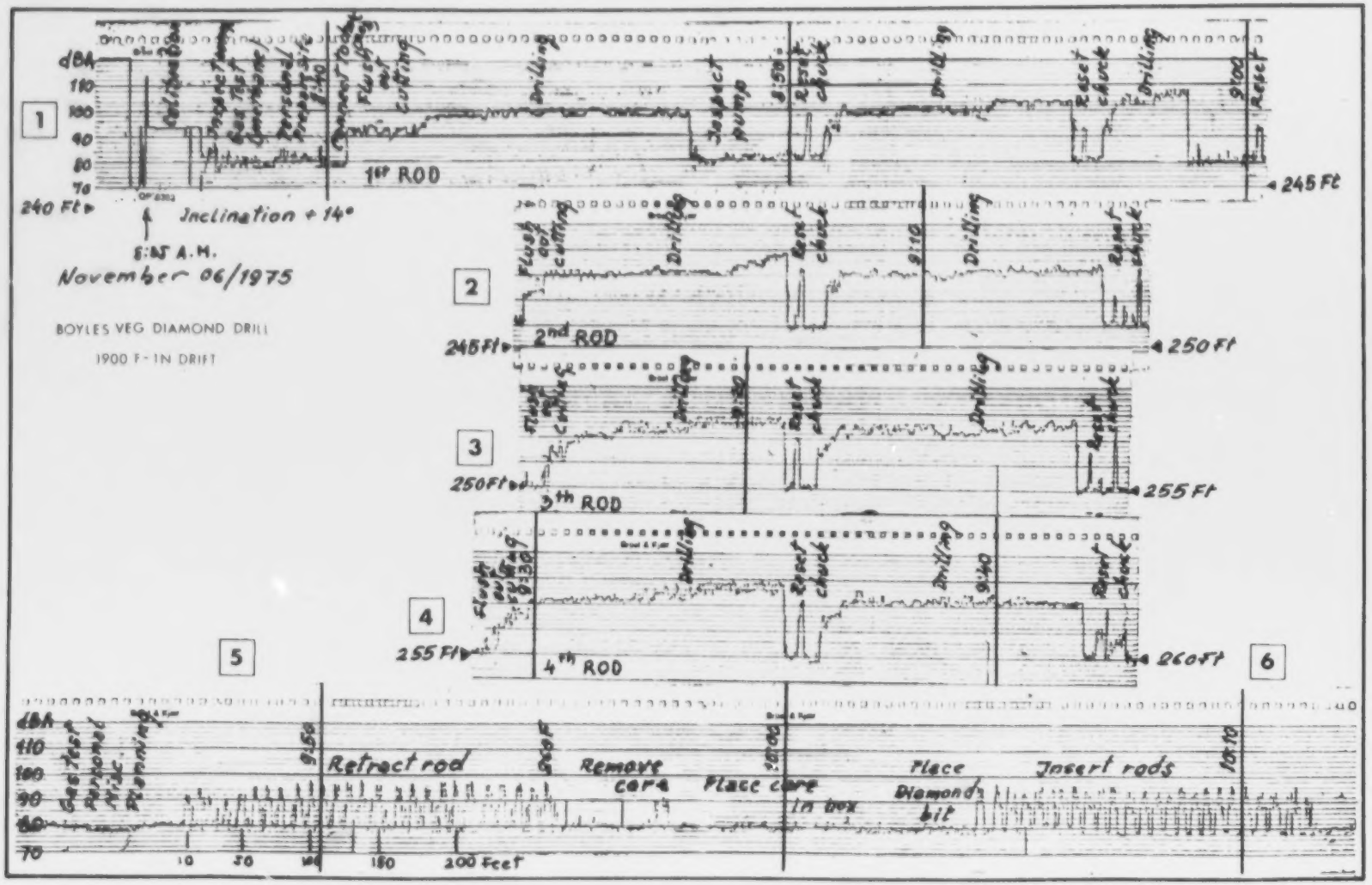


Figure 7.15: Work Time Study with Noise Signal in dBA from Strip Chart Recording.

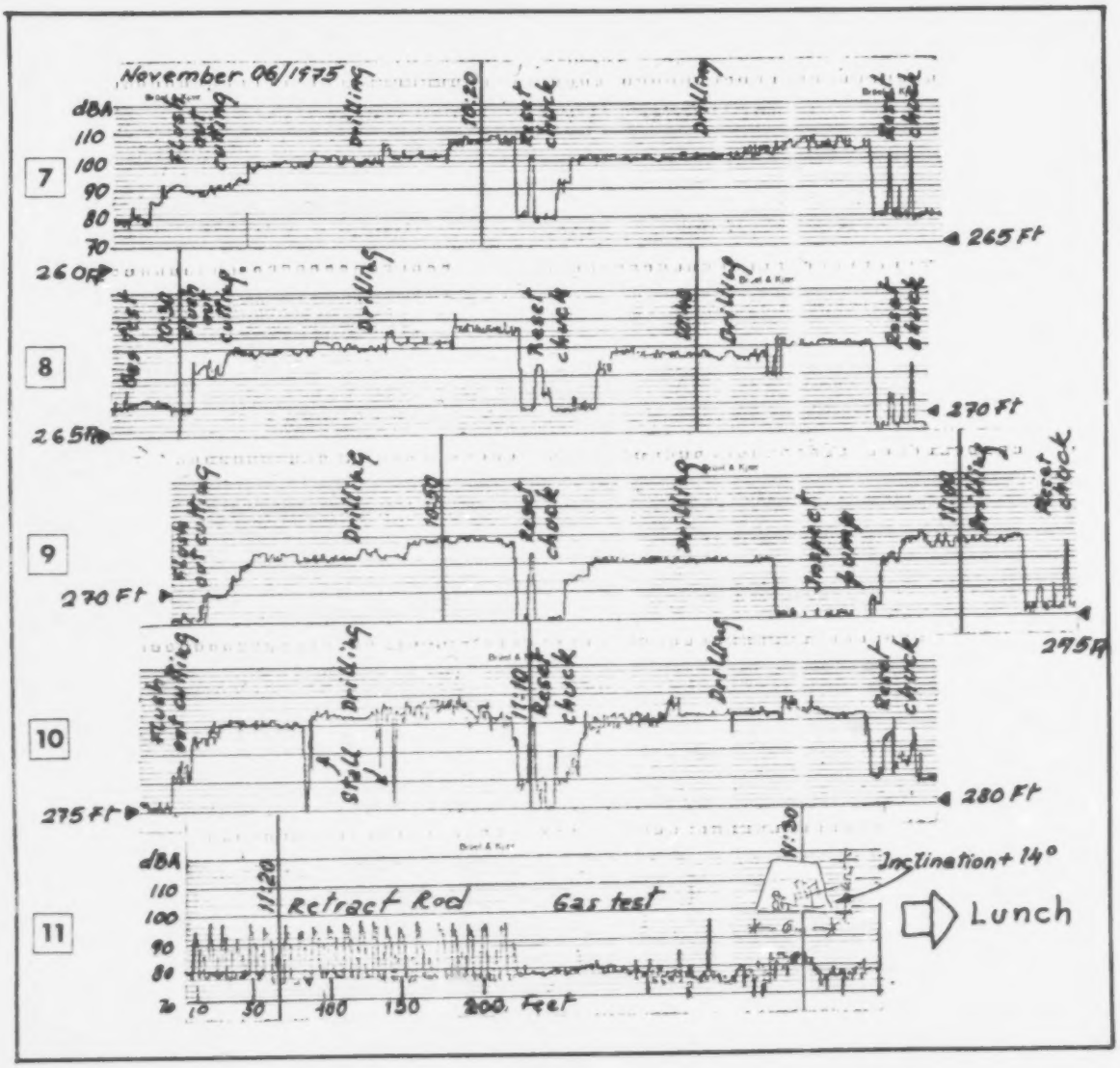


Figure 7.15 (Cont.):

All key headings for time study should be obtained from histograms:

OCC. Occurrences;
R.A. Relaxation Allowance;
E.T. Elapsed Time;
P.R. Performance Rating;
W.T. Watch Time (Stop Watch; and
O.T. Observed Time.

TABLE 7.16

Evaluation of Noise Exposure Index and Equivalent Continuous Sound Level from Figure 7.17

No.	Depth in Ft.	OSHA - Noise Exposure Index										T. Time (Min.)	L_{eq} (dBA)
		90 dBA	92 dBA	95 dBA	97 dBA	100 dBA	102 dBA	105 dBA	110 dBA	115 dBA	Σ		
1	240-245	0.001	0.0022	0.0038	0.0022	0.0725	0.01	0.03	0.03	-	0.1517	14.9	101.3
2	245-250	0.0002	-	0.0008	0.0017	0.0325	0.0617	0.025	0.015	-	0.1369	12	102
3	250-255	0.0002	-	0.0013	0.0022	0.0121	0.03	0.07	0.07	-	0.1858	11.25	104.5
4	255-260	0.0008	0.0006	0.0025	0.0017	0.01	0.0789	0.0183	0.06	-	0.1728	12.7	103.5
5	Retract Rods	0.0025	0.0014	0.0050	0.0039	-	-	-	-	-	0.0128	3.6	94
6	Insert Rods	0.0023	0.0044	0.0067	0.0017	-	-	-	-	-	0.0151	4.6	92.1
7	260-265	0.0017	0.0025	0.001	0.0014	0.025	0.0467	0.0467	0.0433	-	0.1683	13.5	103
8	265-270	0.0023	0.0061	0.0038	0.0139	0.0225	0.0433	0.0033	0.0433	-	0.1385	14.8	100.7
9	270-275	0.0072	0.0061	0.0075	0.0128	0.0175	-	-	-	-	0.0511	11.84	95.6
10	275-280	0.0013	-	0.0042	0.0011	0.0203	0.0556	0.0333	0.05	-	0.1658	12.74	103.2
11	Retract Rods	0.0031	0.0013	0.0006	0.0055	-	-	-	-	-	0.0105	3.1	93
	Σ	0.0224	0.0245	0.0371	0.0481	0.2124	0.3261	0.2267	0.3117	-	1.209	115	101.5

Average E.I. of a set is:

$$\frac{\Sigma(\text{No. 1 - No. 11}) + \text{No. 6}}{8} = \frac{1.209 + 0.015}{8} = 0.153$$

where 8 is the set number.

The average exposure index of 0.153 is reached after 5 ft. of drilling. Clearly, drilling time is dependent upon rock hardness, and the noise level is dependent upon pressure exerted on the bit (35).

No noise measurements were performed in the afternoon, but drilling continued for 25 ft. Thus the exposure index for a full shift will be:

$$\frac{40 + 25}{5} \times 0.153 = 1.989 \text{ or } \sim 2.0$$

Noise dosimeters showed highest results on the operator (3.67, exc 115 dBA), and on the helper (2.90, exc 115 dBA) (Table 3.3, No. 30 and 31). It is not possible to explain the causes of this discordance.

A diamond drilling machine was connected to a BBF 25 water pump. On the muffled pump at the tubing end, the noise was:

95 dBA during pressure build up, and

93 dBA during drilling time.

Without a muffler on the pump the noise was:

112 dBA during pressure build up, and

113 dBA while drilling.

From these measurements it can be seen that the company will have a double benefit: with noise measurements using a level recorder one can obtain exact noise abatement, environment data and time studies for management.

7.6.3 Noise Measurement at 1900 Level 1 Sub W.O.Z., F-1 South (Timber Storage).

The most interesting measurements were performed in a timber storage at the 1900 Level: where one drilling hole ends and a new one begins (Figure 7.16). Graphical data was transformed to numerical data followed by an evaluation of the noise exposure index and equivalent continuous noise level (Table 7.17).

The diamond drilling machine was used under two different conditions at hole depths of 532.5 to 500 ft. and 0 to 25 ft. Results between two measurement sets were different. The machine's exertions were different; for a deeper hole it needed more power, more time, and more noise was emitted.

From these examples it will be evident that a further study into this matter will be required. What should be accepted as the permissible exposure index and how best can measurements be performed in order to obtain good results by short observation? From all measurements done, (i.e. Time/5 ft. rod, permissible exposure/5 ft. rod and L_{eq}/5 ft. rod) graphs were plotted to demonstrate the depth of these problems (Figure 7.17). This graph is valid only in the No. 12 Mine, because the rock and the drilling machines are the same. Also, overall frequency measurement showed this problem (Figure 7.18). Differences in noise levels are remarkable, approximately 6 to 14 dBA. To clarify this observation three more measurements were taken (Figure 7.19):

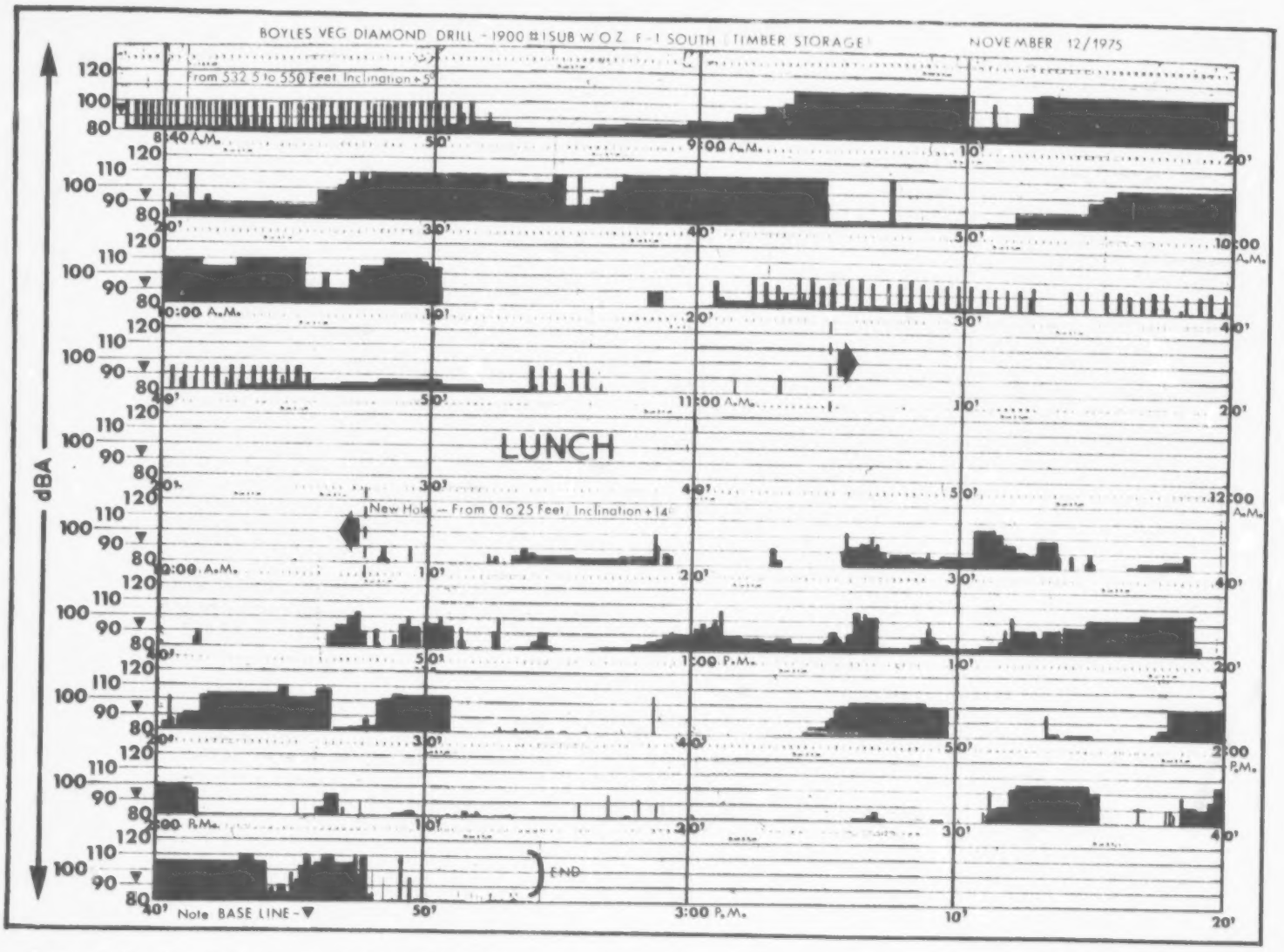

BOYLES VEG DIAMOND DRILL - 1900 #1SUB W O Z F-1 SOUTH TIMBER STORAGE
NOVEMBER 12/1975
From 532.5 to 550 Feet Inclination +55
dBA
LUNCH
New Hole -- From 0 to 25 Feet Inclination +14
END
Note BASE LINE -▼

Figure 7.16: Diamond Driller Shift Histogram:
the end of one hole, and the beginning of a new hole.

TABLE 7.17

Evaluation of the Noise Exposure Index and the Equivalent Continuous Sound Level from Figure 7.18

No.	Depth in Ft.	OSHA - Noise Exposure Index										T. Time Min.	L_{eq} (dBA)
		90 dBA	92 dBA	95 dBA	97 dBA	100 dBA	102 dBA	105 dBA	110 dBA	115 dBA	Σ		
1	Insert rods	0.0006	0	0	0.0009	0.0587	0	0	0	0	0.0602	7.4925	99.5
2	532.5-537.5	0.0006	0	0.0051	0	0.111	0.0037	0.0028	0.4717	0	0.5949	17.4825	108
3	542.5-547.5	0.0054	0	0.0028	0	0.0102	0.0043	0.0426	0.4791	0	0.5444	21.8115	107.7
4	547.5-550	0	0	0	0.0034	0.0042	0.0080	0.111	0.1887	0	0.3153	14.1525	107.2
5	Retract rods	0.0015	0.0019	0.0192	0.0192	0.0069	0	0	0	0	0.0424	8.4083	96.5
Σ		0.0081	0.0019	0.0271	0.0172	0.191	0.016	0.1564	1.1395	0	1.5572	69.3473	107.7
1	0-5	0.0037	0.0035	0.1041	0.0083	0.0065	0.0062	0.0129	0	0	0.1452	9.1572	104.5
2	5-10	0.0030	0.0002	0.0095	0.0065	0.0092	0.03083	0.03885	0	0	0.0981	10.8891	101
3	10-15	0	0.0017	0	0	0.0018	0.0197	0.0805	0.0259	0	0.1296	8.214	104.5
4	15-20	0.0002	0.0008	0.0025	0.0025	0.0379	0.0333	0	0	0	0.0772	8.991	100.3
5	20-25	0.0031	0.0028	0.0328	0	0.1434	0	0	0	0	0.0530	12.099	95.1
Σ		0.01	0.009	0.1489	0.0173	0.06974	0.09003	0.13225	0.0259	0	0.5031	49.3503	101.4

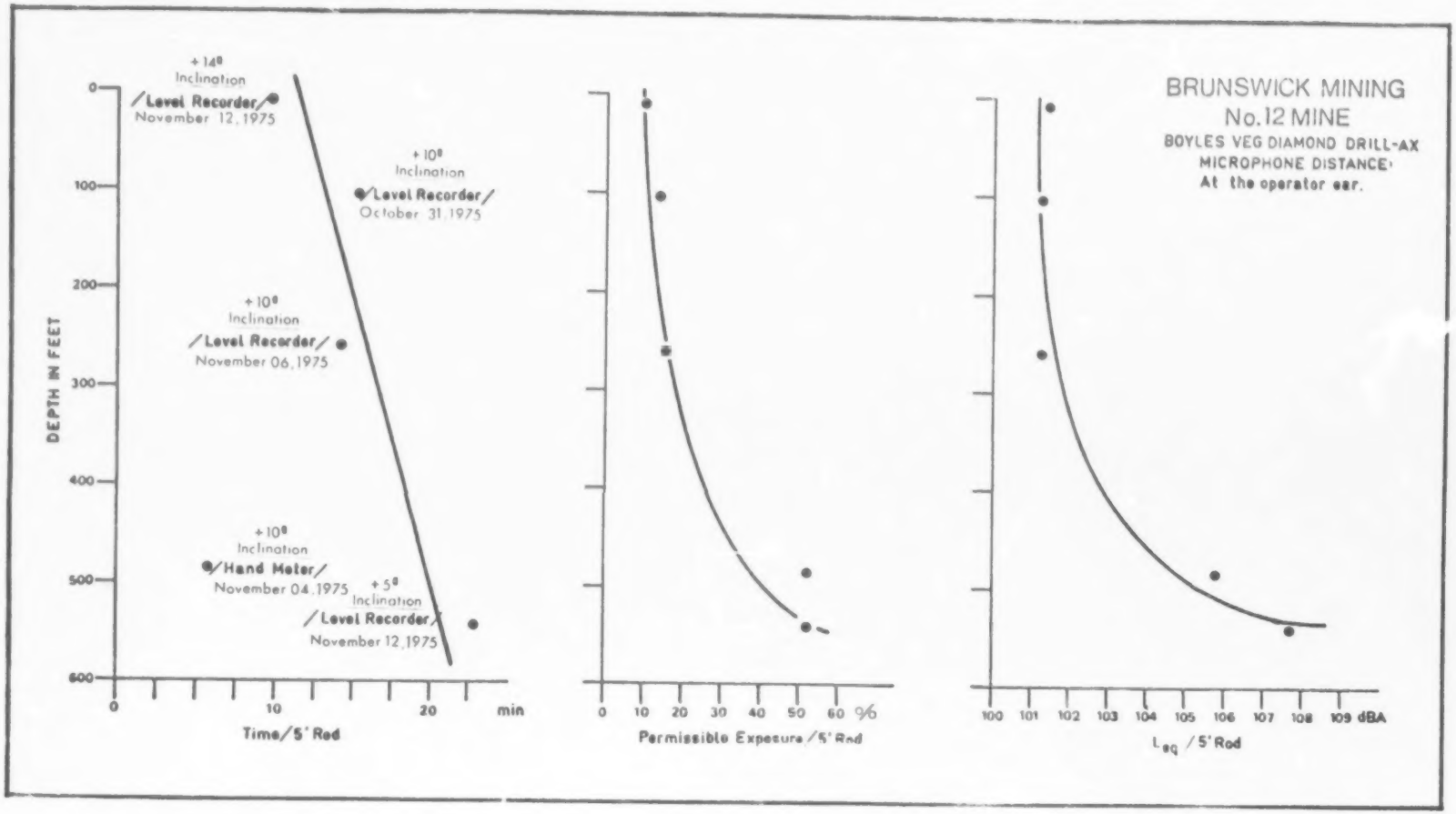


Figure 7.17: Graphical Explanation: Time, Permissible Exposure and Equivalent Continuous Sound Level per 5 Ft. Rod from Measurements in the No. 12 Mine.

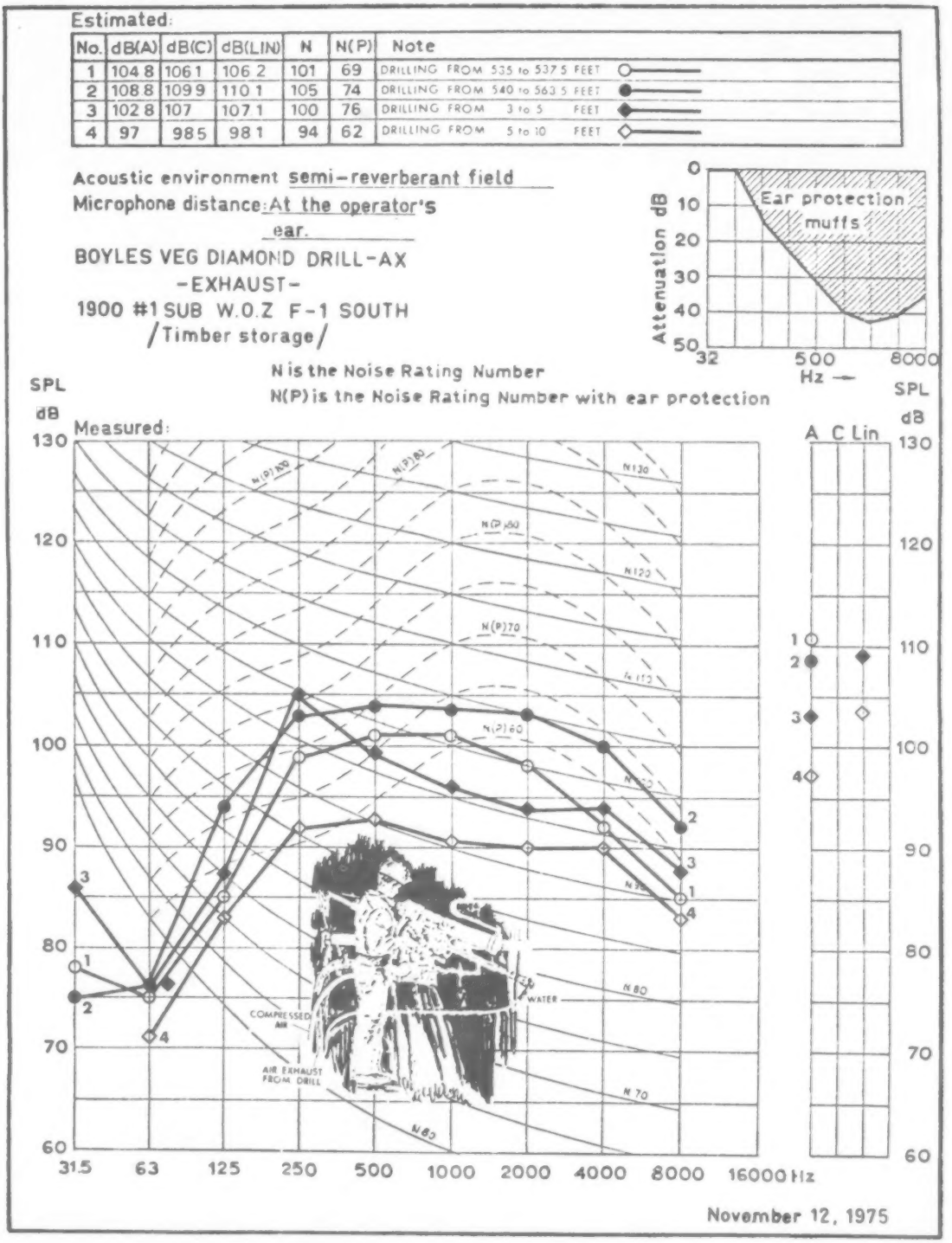

Estimated:
No. dB(A) dB(C) dB(LIN) N N(P) Note
1 104 8 106 1 106 2 101 69 DRILLING FROM 535 to 537 5 FEET
2 108 8 109 9 110 1 105 74 DRILLING FROM 540 to 563 5 FEET
3 102 8 107 107 1 100 76 DRILLING FROM 3 to 5 FEET
4 97 98 5 98 1 94 62 DRILLING FROM 5 to 10 FEET
Acoustic environment semi-reverberant field
Microphone distance: At the operator's ear.
BOYLES VEG DIAMOND DRILL-AX
-EXHAUST-
1900 #1 SUB W.O.Z F-1 SOUTH
/Timber storage/
Attenuation dB
Ear protection muffs
Hz
N is the Noise Rating Number
N(P) is the Noise Rating Number with ear protection
SPL dB
Measured:
A C Lin
N(P)90
N(P)80
N130
N120
N(P)70
N(P)60
N80
N70
N60
COMPRESSED AIR
WATER
AIR EXHAUST FROM DRILL
31.5 63 125 250 500 1000 2000 4000 8000 16000 Hz
November 12, 1975

Figure 7.18: While Drilling a Shallow and Deep Hole, Noise Levels Differed Considerably over all Frequencies.

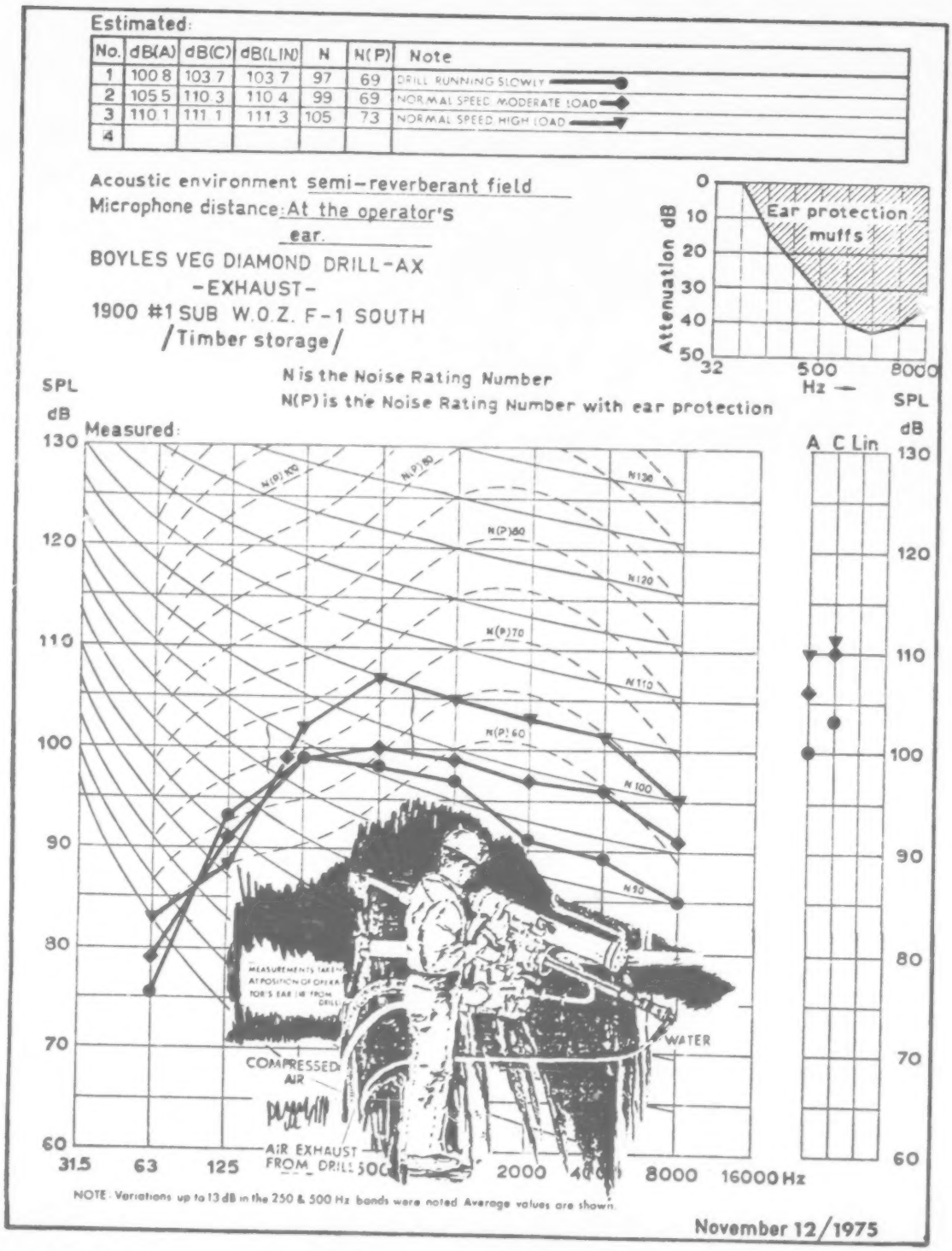

Estimated:
No. dB(A) dB(C) dB(LIN) N N(P) Note
1 100 8 103 7 103 7 97 69 DRILL RUNNING SLOWLY
2 105 5 110 3 110 4 99 69 NORMAL SPEED MODERATE LOAD
3 110 1 111 1 111 3 105 73 NORMAL SPEED HIGH LOAD
4
Acoustic environment semi-reverberant field
Microphone distance: At the operator's ear.
BOYLES VEG DIAMOND DRILL-AX
-EXHAUST-
1900 #1 SUB W.O.Z. F-1 SOUTH
/Timber storage/
Attenuation dB
Ear protection muffs
Hz
N is the Noise Rating Number
N(P) is the Noise Rating Number with ear protection
SPL dB
Measured:
A C Lin
N(P)70
N(P)60
N130
N120
N110
N100
N90
WATER
COMPRESSED AIR
AIR EXHAUST FROM DRILL
31.5 63 125 2000 8000 16000 Hz
NOTE: Variations up to 13 dB in the 250 & 500 Hz bands were noted. Average values are shown.
November 12/1975

Figure 7.19: Octave Band Analysis of Diamond Drilling Machine under a different Load.

- Drill running slowly, 100 dBA;
- Normal speed, moderate load, 106 dBA; and
- Normal speed, high load, 110 dBA.

A lot of attention was focused on Boyles Diamond Drilling Machines because they are Canadian products, and they are very competitive on the market.

7.7 Raise Boring Machine

Raise-boring has many applications, including ore-passes, ventilation air-ways and short-lift hoisting sub-shafts. In the No. 12 Mine, the main applications are for ore-passes and ventilation air-ways.

Raise Borer Security 480, Dresser Industries Ltd., has a reaming cutter Φ6.6 ft. The cutter consists of bits designed for continuous boring. The cutter is driven by an electric motor. Cuttings from the pilot bit are flushed by air and water. The hydraulic and electrical system includes the main hydraulic pumps and the power transformer. The hydraulic power supply provides working thrust and rapid traverse of the derrick assembly. Drill rod sections are in 5 ft. lengths.

The operator's control station has a Drilling Recorder(TOTCO) (Technical Oil Tool Corporation). The drilling recorder is equipped with electrical and hydraulic instruments for measurement of:

1. Thrust (lbs)
2. Penetration (Ft./h)
3. Torque (motor current)

The noise was measured by three instruments:

1. Impulse Precision Sound Level Meter Type 2209, B & K, and Level Recorder Type 2306, B & K, - operator's histogram.

The instrument was calibrated at the beginning of the shift.

2. Sound Level Meter Type 2205, B & K was used as a calibrator for the Impulse Precision Sound Level Meter Type 2209, B & K. Two microphones were placed side by side and the noise was observed. Sound Level Meter Type2205 was calibrated every hour. The goal was not to interfere with the recorder trace.
3. Noise Dose Meter Type 4425 B & K.

The type of noise is continual narrow-band noise. The sound energy is concentrated at frequencies: 125 Hz, 250 Hz, 500 Hz and 1000 Hz (Figure 7.20).

During measurements it was observed that the noise varied from 94 dBA to 96 dBA in the morning, and from 92 dBA to 94 dBA in the afternoon (Figure 7.21).

Had we started out measurements with the Impulse Precision Sound Level Meter Type 2209, B & K, at 8.10 a.m., then the E.I. would equal 1.43. From the shaft entrance to the work area, 7N Bore Hole - 1900 ft, there were no places that emitted noise. Because of this, on the Noise Level Meter Type 4425, B & K, the results are not real.

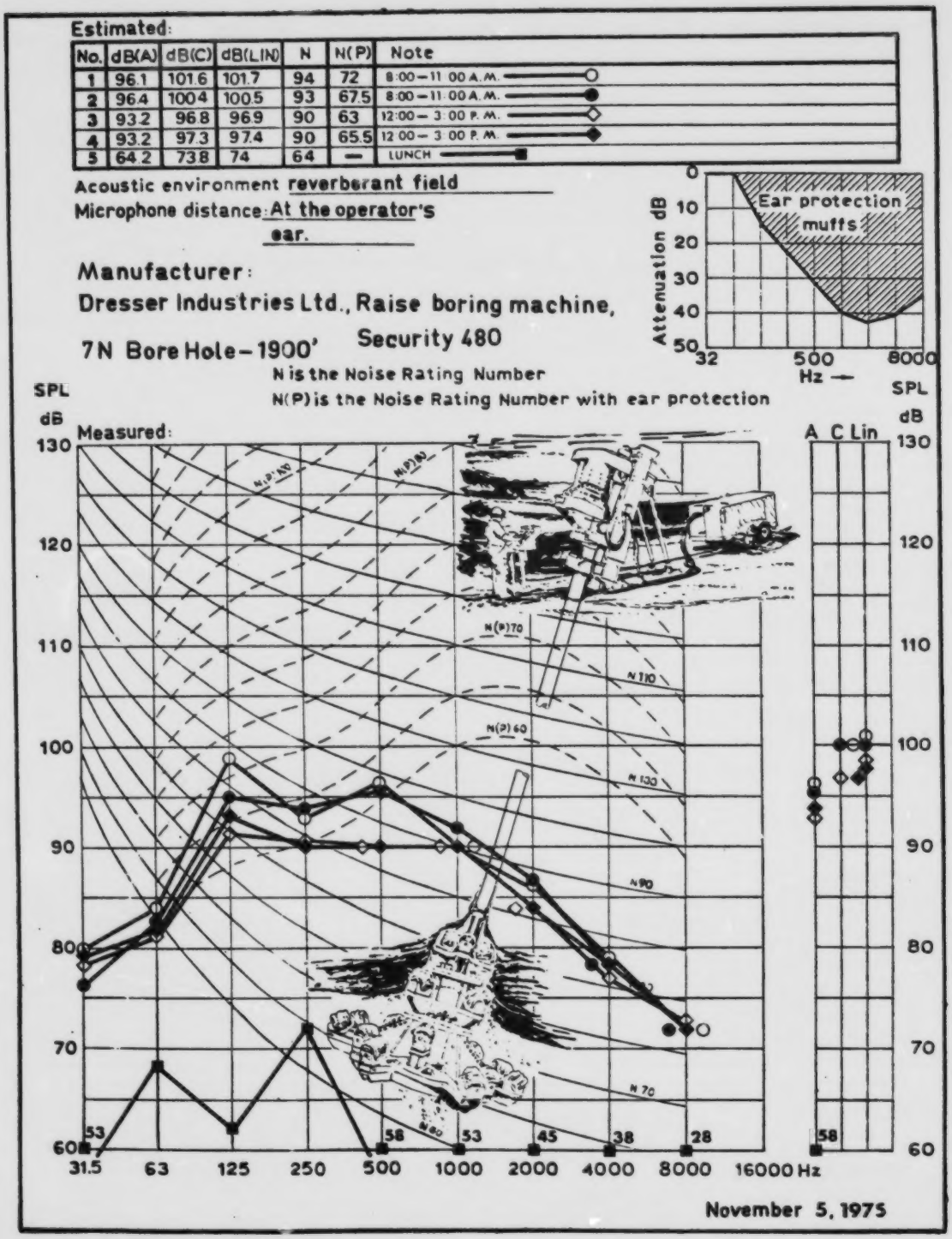

Estimated:
No. dB(A) dB(C) dB(LIN) N N(P) Note
1 96.1 101.6 101.7 94 72 8:00 – 11:00 A.M.
2 96.4 100.4 100.5 93 67.5 8:00 – 11:00 A.M.
3 93.2 96.8 96.9 90 63 12:00 – 3:00 P.M.
4 93.2 97.3 97.4 90 65.5 12:00 – 3:00 P.M.
5 64.2 73.8 74 64 — LUNCH
Acoustic environment reverberant field
Microphone distance: At the operator's ear.
Manufacturer:
Dresser Industries Ltd., Raise boring machine,
7N Bore Hole – 1900' Security 480
N is the Noise Rating Number
N(P) is the Noise Rating Number with ear protection
Attenuation dB
Ear protection muffs
Hz
SPL dB
Measured:
A C Lin
N(P)90
N(P)80
N(P)70
N 110
N(P)60
N 130
N 90
N 70
53 58 53 45 38 28 58
31.5 63 125 250 500 1000 2000 4000 8000 16000 Hz
November 5, 1975

Figure 7.20: Octave Band Noise Data from Raise Boring Machine. The Sound Energy is concentrated from 125 Hz to 1000 Hz.

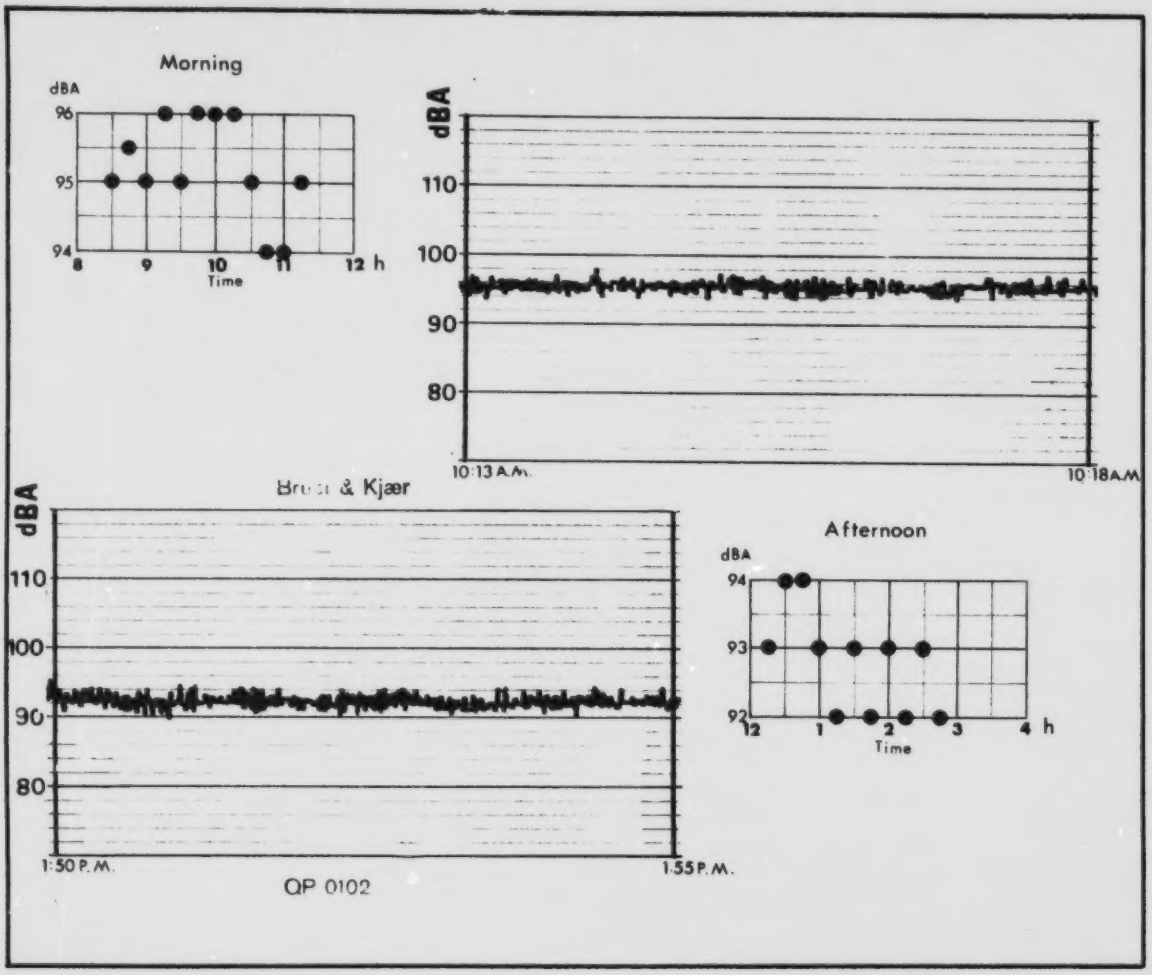


Figure 7.21: Typical Recorder Trace for a Raise Boring Machine during One Shift.

The results of the measurements are:

	Sound Level Meter Type 2209, B & K	Noise Dose Meter Type 4425, B & K
	From 8.35 am - 2.56 pm*	From 8.10 am - 2.56 pm+
E.I.	1.31•	2.31
T. Time (h)	5.06•	5.52
L_{eq} (dBA)	95.3	98.7

* Start is late by 25 minutes for measurements because of cage capacity iimits.

\+ Noise Dose Meter was mounted on a staging area.

• See Appendix 4

During operation of the raise boring machine, the operator was around the hydraulic power station (noise 102 dBA) for a very short period of time, but this is not what caused the difference in results. A magnetic field around the hydraulic motor was probably what influenced the recorded level on the noise dose meter. This experiment will have to be repeated, and the answer to why this happened should be obtained.

As has been said previously, the noise is concentrated at lower frequencies. This noise makes a person sleepy and has bad psychological effects. Ear muffs or ear plugs are enough to provide protection against such noise.

7.8 Noise Exposure of Operators from Rock Drills and Associated Equipment

Noise measurement results showed that the sound level not only exceeded 90 dBA, but it also exceeded 115 dBA. Some attenuations from muffled drilling equipment were made.

Ear muffs and ear plugs should be used to achieve adequate protection for miners because the noise from rock drills and associated equipment is high and traumatic. Theoretical efficiency of ear muffs from drilling noise is shown in Table 7.18.

High-energy machinery, designed for heavy-duty work, frequently turns out to be noisy, even after great care has been taken in redesign, and it requires additional treatment after it has been built.

TABLE 7.18

Permitted Duration of Noise at Operator's Ear
from Rock Drills and Associated Equipment

No.	Equipment	Maximum (dBA)		Exposure Limits (h)		Note
		N*	N(P)+	Without Ear Muff	With Ear Muff	
1	Jackleg (JR-300)	119	90	0.15	8	Data from previous measurement.
2	Jackleg with Muffler (JR-300M)	115	86	0.25	No limit	
3	Stoper RB 83	117	82	0.20	No limit	Page 73, Figure 7.3
4	Wills Wagon Two Drills (IR-300)	114	82	0.28	No limit	Page 78, Figure 7.4
5	630 Stope Jumbo Two Drills BBC 100F	123	91	0.084	6.97	Page 88, Figure 7.7
6	Jarvis Clark Jumbo ES-300, 3 drills	113	85	0.33	No limit	Page 94, Figure 7.8
7	Boyles VEG Diamond Drill	105	73	1.0	No limit	Page 116, Figure 7.19
8	Raise Boring Machine Security 480	94	72	4.6	No limit	Page 119, Figure 7.20

* N is the Noise Rating Number.

+ N(P) is the Noise Rating Number with ear protection.

8. SOUND LEVEL ATTENUATION OF EAR MUFFS USED IN NO. 12 MINE

Hearing-protective devices in present use in No. 12 Mine are mainly muff types. The muff type hearing-protective devices are acoustical barriers that reduce the amount of sound energy transmitted to the miner's inner ear.

The sound attenuation capability of an ear muff at threshold is the difference (in decibels) between the threshold of audibility for a miner with hearing protectors in place (test threshold) and the threshold when his ears are open and uncovered (reference threshold).

In the selection of ear muffs the following design factors are taken into consideration (36):

Performance;

Comfort;

Communication requirements; and

Appearance.

The mean hearing protection and standard deviation of ear muffs is determined by the manufacturer in accordance with ANSI Z 24.22 - 1957 or 53.19 - 1973, Real Ear Method (37).

The standard deviation (δ) is computed using the formula (36):

$$\delta = \sqrt{\frac{\Sigma d^2}{N - 1}} \quad \text{---------- Equation (8.1)}$$

where "d" is the difference between the grand mean and an individual observation, and where N is the number of observations.

In determining the attenuation values of ear muffs, the manufacturer's

test data must be examined carefully.

8.1 Control of Attenuation of Ear Muffs in the Workplace

Published references, such as those of the American National Standards Institute and of the American National Institute of Occupational Safety and Health (NIOSH) provide information for selecting hearing-protective devices (38). A proposed regulation requires that any hearing protector used by an employee shall reduce the effective noise level to less than 90 dBA (OSHA). This regulation suggests three methods for determining the noise reduction (R), given in sections 1, 2 and 3 below.

The determination of R is based on a knowledge of the attenuation of the ear protectors in octave bands and an A-slow sound level analysis of the noisy environment. The pure tone attenuation vs. frequency characteristics of the ear protector (normally supplied by the manufacturer) should be determined in accordance with the American National Standard for Measurement of the Real-Ear Attenuation of Ear Protectors at Threshold, ANSI Z24.22 (1957). The Standard prescribes pure-tone tests at 125, 250, 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz. We will also assume that the 4000 Hz octave band attenuation level can be obtained by averaging the pure tone attenuation levels at 3000 and 4000 Hz, and that the 8000 Hz octave band attenuation level can be obtained by averaging the pure tone attenuation levels at 6000 and 8000 Hz. This method has been formulated concisely by the Recommended Noise Standard, and includes subtraction of 10 dB to account for possible noise spectrum irregularities and noise leakage which might be caused by long hair, safety glasses, head movement, etc.

Evaluation of the pure tone attenuation supplied by the manufacturer:

Let Q_1, Q_2, ..., Q_7 be defined (in dB) as follows:

Q_1 = attenuation at 125 Hz, plus 16.2 dB (+ 16 dB),

Q_2 = attenuation at 250 Hz, plus 8.7 dB (+ 9 dB),

Q_3 = attenuation at 500 Hz, plus 3.3 dB (+ 3 dB),

Q_4 = attenuation at 1000 Hz,

Q_5 = attenuation at 2000 Hz, minus 1.2 dB (- 1 dB),

Q_6 = average of attenuation at 3000 and 4000 Hz, minus 1.0 dB (- 1 dB),

Q_7 = average of attenuations at 6000 and 8000 Hz, plus 1.1 dB (+ 1 dB).

1. The procedure to determine the dBA reduction (R):

   Let L_1, L_2, ..., L_7 denote the octave band levels in dB at 125, 250, 500, 1000, 2000, 4000, and 8000 Hz respectively, and let L_A denote the dBA-Slow level of the noise. Then the dBA reduction as corrected is given by $R = L_A - 10 \log S - 10.0$ ----------Equation (8.2)

   where: 10.0 is the correction factor,

   S = antilog $(0.1 \times [L_1 - Q_1])$ + antilog $(0.1 \times [L_2 - Q_2])$

   + antilog $(0.1 \times [L_3 - Q_3])$ + antilog $(0.1 \times [L_4 - Q_4])$

   + antilog $(0.1 \times [L_5 - Q_5])$ + antilog $(0.1 \times [L_6 - Q_6])$

   + antilog $(0.1 \times [L_7 - Q_7])$.

2. If the octave band levels of the noise are not known, then the dBA reduction R may be computed simply as:

   $R = - 10 \log S - 3.0$ ----------Equation (8.3)

   where:

$$S = \text{antilog}(-0.1 \times Q_1) + \text{antilog}(-0.1 \times Q_2) + \text{antilog}(-0.1 \times Q_3) + \text{antilog}(-0.1 \times Q_4) + \text{antilog}(-0.1 \times Q_5) + \text{antilog}(-0.1 \times Q_6) + \text{antilog}(-0.1 \times Q_7).$$

This calculation is approximate, and is based upon the assumption that the octave band levels are equal. For most types of noise it will give results close to those obtained by the more accurate method above.

3. The method is the same as Method 1 except that $(Q_1 - 2\,\delta Q_1)$ is subtracted from L_1 (39).

For measuring efficiency of ear muffs a Boyles VEG Diamond Drill was used because of the following reasons (see Chapter 7.7):

(1) The type of noise is intermittent where there are several periods of steady-state noise with intervals of ambient noise. Spectrum frequency measurements and ear muff exchanges can be carried out without any work shut-down.

(2) There are many places where measurements can be carried out and where surveyors can move around without interfering with the drill operator.

(3) An isolated place was chosen where other machines would have no effect on the noise level.

(4) The lighting conditions were good, and all phases of work, and worker's head movements could be easily followed.

In Table 8.1 values of sound level attenuation of ear muffs used in No. 12 Mine are given. In three cases, attenuation was good and they meet

TABLE 8.1

Determinations of Sound Level Attenuation of Ear Muffs in No. 12 Mine

EAR MUFF	NOISE REDUCTION CALCULATION						NOISE DOSE METER, B&K				
	NOISE SOURCE OCTAVE BAND MEASUREMENTS		MODIFYING FACTORS FOR NOISE REDUCTION				NOISE DOSE %		TIME min.	EQUIVALENT SOUND LEVEL-L_{eq}	
	Center Frequency	SPL dB B	A-Weighting Factor A	2 σ C	Ear Protector Attenuation D	Resultant Noise at Ear B + A +C −D	Over muff	Under muff		dBA Over muff (Om)	dBA Under muff (Um)
1 David Clark E705 "Hard Boiled" Cap	125	87.5	-16	2x2.5	12	64.5	52.6	39.4	13	110.2	107
	250	101.5	- 9	2x3.0	17	81.5					
	500	106.5	- 3	2x4.6	30	82.7					
	1K	105	0	2x5.6	35	81.2					
	2K	102.5	+ 1	2x4.5	35	77.5					
	4K	101	+ 1	2x1.2	37	73.4					
	8K	95	- 1	2x2.9	30	69.8					
	dBA	109.8			Lin.	87.4					
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) 22.4					AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um) Yes ☐ No ☑					
	L_{eq}(Om) − R = Noise under muff 87.8										
2 David Clark E705 (own old cap)	125	91	- 16	2x2.5	12	68	34.7	29.9	19	105.5	104
	250	102.5	- 9	2x3.0	17	82.5					
	500	102	- 3	2x4.6	30	78.2					
	1K	100	0	2x5.6	35	76.2					
	2K	96	+ 1	2x4.5	35	71					
	4K	96	+ 1	2x4.2	37	68.4					
	8K	90.5	- 1	2x2.9	30	65.3					
	dBA	105.9			Lin.	85					
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) 20.9					AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um) Yes ☐ No ☑					
	L_{eq}(Om) − R = Noise under muff 84.6										
3 David Clark E705 (new cap)	125	95	- 16	2x2.5	12	72	24.7	2.2	17	104	87
	250	101	- 9	2x3.0	17	81	24.7	2.6	14	105.1	89.3
	500	101	- 3	2x4.6	30	77.2					
	1K	99	0	2x5.6	35	75.2					
	2K	97	+ 1	2x4.5	35	72					
	4K	95	+ 1	2x4.2	37	67.2					
	8K	90	- 1	2x2.9	30	64.8					
	dBA	104.3			Lin.	84					
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) 20.3					AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um) Yes ☑ No ☐					
	L_{eq}(Om) − R = Noise under muff 84.7										

By: M.U.Savich

NOTE: (1) Driller was issued his hat only 3 months ago, but the measured muff is obviously defective as it provided almost no attenuation. The muff was found to fit poorly due to improper spring tension.

TABLE 8.1 (Cont.)

EAR MUFF	NOISE REDUCTION CALCULATION						NOISE DOSE METER, B&K				
	NOISE SOURCE OCTAVE BAND MEASUREMENTS		MODIFYING FACTORS FOR NOISE REDUCTION				NOISE DOSE %		TIME min.	EQUIVALENT SOUND LEVEL-L_{eq}	
	Center Frequency	SPL dB B	A-Weighting Factor A	2 σ C	Ear Protector Attenuation D	Resultant Noise at Ear B + A +C −D	Over muff	Under muff		dBA Over muff (Om)	dBA Under muff (Um)
4 Amer. Optical 1776 ≅ 1775	125	93	- 16	2x3.2	9.7	73.7	54.1	35.4	9.5	114	110.7
	250	102	- 9	2x2.5	16.1	81.9					
	500	105.5	- 3	2x2.8	24.9	83.2					
	1K	103	0	2x5.1	33.9	79.3					
	2K	99.5	+ 1	2x2.9	34.1	72.2					
	4K	98	+ 1	2x5.7	41.0	69.4					
	8K	91	- 1	2x5.9	31.5	70.3					
	dBA	107.7			Lin.	87.1					
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) 20.6 $L_{eq}(Om) - R$ = Noise under muff 92				AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um)		Yes ☐	No ☑			
5 Amer. Optical 1275	125	91	- 16	2x3.5	6	76	25.5	5.8	20	103.7	92
	250	109	- 9	2x3	13	93	28.7	0.3			
	500	100	- 3	2x1	23	76					
	1K	99	0	2x2	34	69					
	2K	97	+ 1	2x1	36	64					
	4K	96	+ 1	2x3	40	63					
	8K	91	- 1	2x3.5	24	73					
	dBA	105.5			Lin.	93.2					
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) 12.3 $L_{eq}(Om) - R$ = Noise under muff 91.4				AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um)		Yes ☑	No ☐			
6 David Clark "Straightaway" E-805	125	91	- 16	2x2.0	10	69	25	1	23.5	101.9	79
	250	98.5	- 9	2x2.6	17	77.7	31	1			
	500	103.5	- 3	2x4.3	28	81.1					
	1K	99	0	2x5.4	37	72.8					
	2K	100	+ 1	2x4.5	36	74					
	4K	98	+ 1	2x3.8	39	67.6					
	8K	92	- 1	2x4.9	30	70.8					
	dBA	106.2			Lin.	84.11					
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) 22.1 $L_{eq}(Om) - R$ = Noise under muff 79.8				AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um)		Yes ☑	No ☐			

By: M.U.Savich

NOTE: (5) and (6) The American Optical 1275 and David Clark "Straightaway" E-805 are separate muffs that are worn with the headband behind the head. No adjustments are possible for proper fit. Both these muffs are considered to be uncomfortable when worn for more than a few minutes.

TABLE 8.1 (Cont.)

EAR MUFF	NOISE REDUCTION CALCULATION						NOISE DOSE METER, B&K				
	NOISE SOURCE OCTAVE BAND MEASUREMENTS		MODIFYING FACTORS FOR NOISE REDUCTION				NOISE DOSE %		TIME min.	EQUIVALENT SOUND LEVEL-L_{eq}	
	Center Frequency	SPL dB B	A-Weighting Factor A	2 σ C	Ear Protector Attenuation D	Resultant Noise at Ear B + A +C −D	Over muff	Under muff		dBA Over muff (Om)	dBA Under muff (Um)
7 Safety Supply Co. on Safe-T-Cap "Guard-All"	125	83	− 16		18	65	17	1.7	13	103.5	86.5
	250	97.5	− 9		23	74.5					
	500	98.5	− 3		33	65.5					
	1K	96	0		44	52					
	2K	96	+ 1		44	52					
	4K	95	+ 1		45	50					
	8K	90	− 1		39	51					
	dBA	102.6	$S = \text{antilog}\frac{dB}{10} + \cdots + \text{antilog}\frac{dB}{10}7 =$			0.35×10^8					
	$L_{(A)} - 10\log S - 10 = R$ (Red Factor)		17.1								
	$L_{eq}(Om) - R$ = Noise under muff		86.4				AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um)			Yes ☑	No ☐
Hellberg Protection A. B NO NOISE Ear Muffs, NNIII. Ear Cup Kit mounting on Safe-T-Cap 8	125	83	− 16		− −	− −	23.7	12.6	− −		
	250	97.5	− 9		23	74.5					
	500	98.5	− 3		29.5	69					
	1K	96	0		36.5	59.5					
	2K	96	+ 1		37	59					
	4K	95	+ 1		39	56					
	8K	90	− 1		40	50					
	dBA	102.6	$S = \text{antilog}\frac{dB}{10}2 + \cdots + \text{antilog}\frac{dB}{10}7 =$			0.38×10^8					
	$L_{(A)} - 10\log S - 10 = R$ (Red Factor)		16.6								
	$L_{eq}(Om) - R$ = Noise under muff						AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um)			Yes ☐	No ☐
Welsh 4426 on Safe-T-Hat 9	125	92	− 16		15	77	18	4.6	15	103	92.7
	250	103	− 9		23	80					
	500	107	− 3		31	76					
	1K	99	0		38	61					
	2K	96	+ 1		37	59					
	4K	95	+ 1		44	51					
	8K	90	− 1		31	69					
	dBA	106.6	$S = \text{antilog}\frac{dB}{10} + \cdots + \text{antilog}\frac{dB}{10}7 =$			2.00×10^8					
	$L_{(A)} - 10\log S - 10 = R$ (Red. Factor)		8.3								
	$L_{eq}(Om) - R$ = Noise under muff		94.7				AGREEMENT WITH NOISE DOSE METER − L_{eq} (Um)			Yes ☑	No ☐

By: M.U.Savich

NOTE: (8) The ear protector is to be used in same area as No. 7 with noise level of 102.6 dBA. (9) The support of the Welsh 4426 muffs interfered with the hat brim. This was caused by poor installation and can probably be corrected.

TABLE 8.1 (Cont.)

EAR MUFF	NOISE REDUCTION CALCULATION						NOISE DOSE METER, B&K				
	NOISE SOURCE OCTAVE BAND MEASUREMENTS		MODIFYING FACTORS FOR NOISE REDUCTION				NOISE DOSE %		TIME min.	EQUIVALENT SOUND LEVEL-L_{eq}	
	Center Frequency	SPL dB B	A-Weighting Factor A	2 σ C	Ear Protector Attenuation D	Resultant Noise at Ear B + A +C -D	Over muff	Under muff		dBA Over muff (Om)	dBA Under muff (Um)
10 Welsh 4425 on Safe-T-Cap "Guard-All"	125	93	-16		- -		29.7	22.6	- -		
	250	99	- 9		- -		10.7	5.6	- -		
	500	98	- 3		- -		18.7	0.9	- -		
	1K	97	0		- -		13.8	1.2	- -		
	2K	91	+ 1		- -						
	4K	89	+ 1		- -						
	8K	85	- 1		- -						
	dBA	100.8			Lin.						
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor. L_{eq}(Om) - R = Noise under muff				AGREEMENT WITH NOISE DOSE METER – L_{eq} (Um)					Yes ☐	No ☐
	125										
	250										
	500										
	1K										
	2K										
	4K										
	8K										
	dBA				Lin.						
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) L_{eq}(Om) - R = Noise under muff				AGREEMENT WITH NOISE DOSE METER – L_{eq} (Um)					Yes ☐	No ☐
	125										
	250										
	500										
	1K										
	2K										
	4K										
	8K										
	dBA				Lin.						
	$L_{(A)} - L_{(L)}$ = R (Reduction Factor) L_{eq}(Om) - R = Noise under muff				AGREEMENT WITH NOISE DOSE METER – L_{eq} (Um)					Yes ☐	No ☐

By: M.U.Sovich

NOTE: (10) The Welsh Model 4425 does not fit well on the "Guard-All" Safe-T-Cap as the muff cushion can easily overlap the cap head band, resulting in a poor fit, care must be taken when placing the muffs over the ears.

OSHA requirements (No. 3, No. 6 and No. 7). In five cases, attenuation was not satisfactory (No. 1, No. 2, No. 4, No. 5 and No. 9), and in the remaining two cases, measurement results were not completed (No. 8 and No. 10). The noise reduction factor (R) was determined thrice according to M. W. Basch's method (39), the factor was determined six times (No. 1 to No. 6). The factory did not give information about the attenuation of one ear muff.

As mentioned above, the reduction factor (R) can be determined even if the octave-band levels of noise are not known.

Example:

The pure-tone attenuation characteristics of an ear muff, Safety Supply Co., on Safe-T-Cap "Guard All" (No. 7), are as follows:

125	250	500	1K	2K	4K	8K	Hz
18	23	33	44	44	45	39	dB
+ 16	+ 9	+ 3	0	- 1	- 1	+ 1	
Q_1=34	Q_2=32	Q_3=36	Q_4=44	Q_5=43	Q_6=44	Q_7=40	

In this case the reduction factor is:

$$R = -10 \log S - 30$$

where: S = antilog (-3.4) + antilog (-3.2) + antilog (-3.6)
+ antilog (-4.4) + antilog (-4.3) + antilog (-4.4)
+ antilog (-4.0)

or $S = 0.00887$

Therefore, $R = 10 \log 0.00887 - 3.0 = 20.6 - 3.0 = 17.6$ dBA

The reduction factor from Table 7.1, No. 7 is almost equal to the estimated

factor by the above method (17.1 dBA ≈ 17.6 dBA).

Measurements showed that the desired equal attenuation is not always achieved under the same conditions and on the same person.

8.2 Accuracy of Measurements

To check that the measurements are correct Table 8.2 was constructed. From this Table it is evident that the measurements were taken with the greatest possible precision.

The measurements were conducted independently by two surveyors with five instruments, two sound level meters, one level recorder and two noise dosimeters.

8.3 Measurement of the Attenuation of Ear Muffs in the Laboratory

Measurements of the attenuation of ear muffs have been conducted for two versions using human heads and an apparatus for determining the efficiency of cup cushions. These tests were conducted to provide performance data for four models of ear muffs under testing procedures established in the Elliot Lake Laboratory.

No.	All Ear-Muffs	Determinations of Sound Level Attenuation in the Laboratory	Note
1	David Clark E-705 "Hard Boiled" Cap	David Clark E-705 "Hard Boiled" Cap	-
2	David Clark E-705 (own old cap)		
3	David Clark E-705 (new cap)		
4	Amer. Optical 1776	Americal Optical Hear Guard Model 1775	Model 1776 ≈Model 1775
5	Amer. Optical 1775	-	-
6	David Clark E-805 "Straightaway"	David Clark E-805 "Straightaway"	-
7	Safety Supply Co. on Safe-T-Cap "Guard-All"	-	-
8	Heilberg Protection A. B. No Noise Ear Muffs N. N. III. Ear Muff Kit.	Heilberg Protection A. B. No Noise Ear Muffs N. N. III. Ear Muff Kit.	
9	Welsh 4426 on Safe-T-Hat	-	
10	Welsh 4425 on Safe-T-Hat "Guard-All"	-	

TABLE 8.2

Accuracy of Sound Level Attenuation Measurements of Ear Muffs in No. 12 Mine

No.	Sound Level Meter, GR 1933 Precision					Noise Dose Meter B & K Type 4425		Agreement	Note
	Noise in dBA					Noise in dBA			
	Meas.+	Est'd++	Differ.	L_{eq}*	Under Muff	Over Muff	Under Muff		
1	110	109.8	-0.2	107.6	> 87.8	110.2	>107	> No	
2	104.5	105.9	+1.4	107.6	> 84.6	105.5	>104	> No	
3	105	104.3	-0.7	107.6	▶ 84.7	105.1	▶ 89.3	▶ Yes	
4	108	107.7	-0.3	107.6	> 92	114	>110.7	> No	
5	106	105.5	-0.5	107.6	▶ 91.4	103.7	▶ 92.3	▶ Yes	
6	108	106.2	-1.8	107.6	▶ 79	101.9	▶ 79.8	▶ Yes	
7	103	102.6	-0.4	102.6	▶ 86.5	103.5	▶ 86.4	▶ Yes	
8	-	102.6	-	102.6	-	-	-	-	Not enough data.
9	103	106.6	+3.6	102.6	▶ 94.7	103	▶ 92.7	▶ Yes	
10	100	100.8	+0.8	102.6	-	-	-	-	Not enough data.

+Measured at the operator's ear.

++ Total noise estimated from the octave-band noise levels. Approximate agreement with measured total noise indicates reasonably constant conditions during period of measurement.

* The equivalent continuous sound level L_{eq} = 107.6 dBA (Table 7.17, from 532.5-550 feet.) and L_{eq} = 102.6 dBA (Table 7.17 from 5 feet to 20 feet). Instrument: Sound Level Meter Type 2209 B & K and a Level Recorder Type 2206 B & K. Approximate agreement is between the equivalent sound level and measured or estimated noise levels.
Average from No. 1-6: Meas. = 106.9 dBA; Est'd = 106.6 dBA; L_{eq} = 107.6 dBA.
Average from No. 7-10: Meas. = 102 dBA; Est'd = 103.15 dBA; L_{eq} = 102.6 dBA.

These measurements were not in strict compliance with the American Standards Association requirements for the measurement of real-ear attenuation of ear protectors at threshold (37). The standard specifies that the hearing thresholds of at least 10 randomly selected subjects with normal hearing shall be taken with and without the ear protector under test, on no less than three separate occasions, at each test frequency. The differences with and without protectors are taken to measure the protectors attenuation.

8.3.1 Instrumentation

A block diagram of the test equipment is shown in Figure 8.1. The test signals were produced with a Bruel and Kjaer, Random Noise Generator, Type 1402 and Hewlett-Packard Test Oscillator, Model 650A. The high powered loudspeaker was orientated to eliminate directional effects and to achieve a diffuse noise field condition. The microphone was suspended 1.3 m above the floor located in the middle of the room. The tests were conducted in a constant-temperature semi-reverberant room 4.25 m long, 4 m wide and 2.5 high. The walls, ceiling and floor were of wood construction,

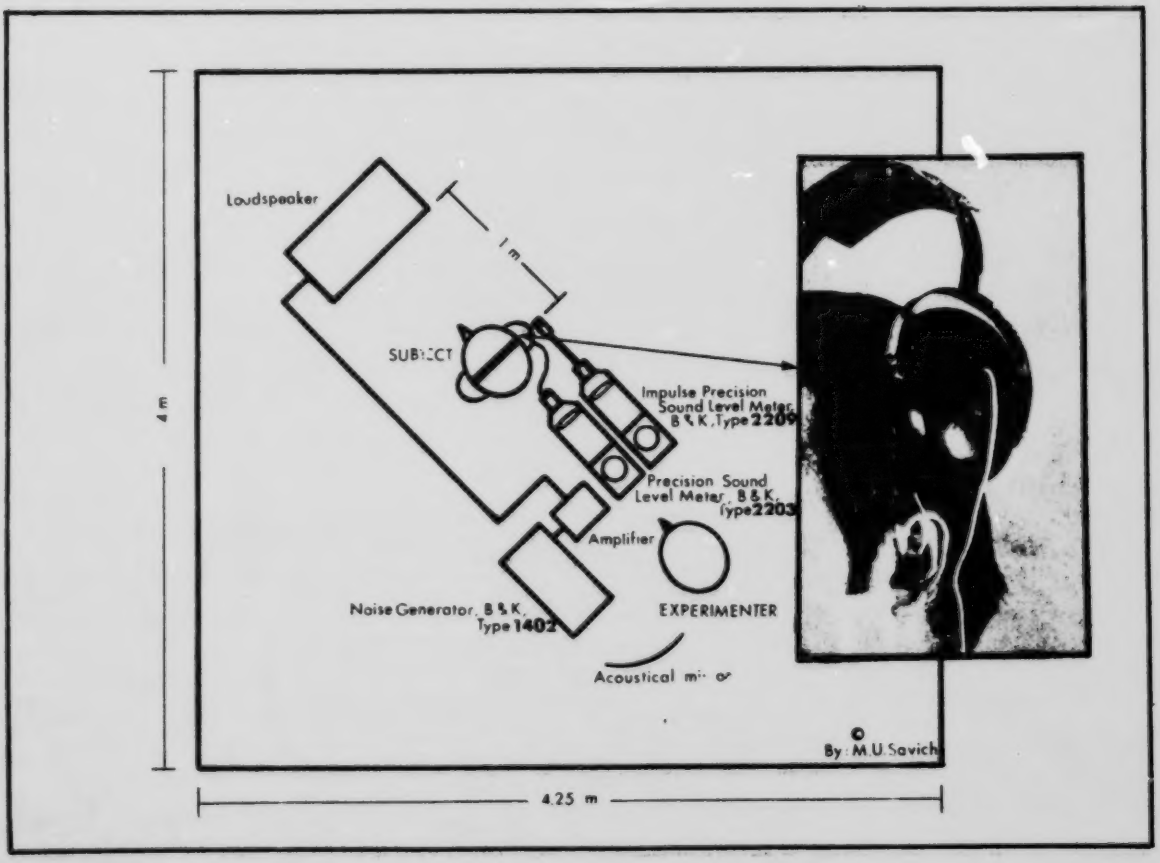


Figure 8.1: Block Diagram of Experimental Apparatus.

and there was one window and door in the room. The room was empty.

Measurements of variations in sound pressure level for a constant signal level were made at the head position. These data are shown in Table 8.3. The measurements were taken on the left and right sides of the head, because of the asymmetric character of the head.

8.3.2 Subject Selection

Subjects for these tests were selected from the general available population. Consequently, these two test subjects constituted a representative sample of the population who might be expected to use these devices. One test subject was 35 years old and a second test subject was 54 years of age. The hearing in this situation had no important role, because the human head replaced the dummy.

8.3.3. Test Procedure Using Human Heads

Fitting Procedure: The process of fitting an ear protector is one of the most important factors affecting the sound attenuation characteristics of the device. Prior to the tests, each of the subjects was self-controlled in the correct fitting procedure for the four models of ear muffs. The device was positioned once more by the experimenter and then positioned in the final orientation by the subject.

Attenuation Measurements: The ear attenuation was determined at the following frequencies: 125, 250, 500, 1000, 2000, 4000 and 8000 Hz and dBA network. The test signal were produced with a Random Noise Generator, B and K, Type 1402. An acoustical mirror was used to obtain constant sound levels of signal. There were two trials during each test

TABLE 8.3

Attenuations of Ear-Muffs Using Human Heads in the Laboratory

D (cm)	Force (g wt)	Hemisphere	Measurements Using Human Heads	David Clark* E-705 "Hard Boiled" Cap		American Optical* Hear Guard Model 1977		David Clark E-805 "Straightaway"		Hellberg Protection No noise Ear Cup Kit N, N, III		Arithmetic Mean of all Ear Muffs	
				Attenuation (dBA)		Attenuation (dBA)		Attentuation (dBA)		Attenuation (dBA)		Attenuation (dBA)	
				Meas.	Est'd	Meas.	Est'd	Meas.	Est'd	Meas.	Est'd	Meas.	Est'd
15.3	~1000	Left	Muff	31.5	31	30.5	29	29.5	31	24.5	25.5	29	29.13
			Muff and Glasses	29.5	29	26.5	27.5	29	29	36	36	30.25	30.38
			Muff, Glasses & Adapter+	28.5	28	24	25	37	26	31.5	33	28.75	28
			Σ 13	29.8	29.3	27	27.2	29.8	28.7	30.7	31.5	29.33	29.17
17	~1000	Left	Muff	36	35	37	37	33	36	32.5	32.5	34.63	35.13
			Muff and Glasses	37.5	38	35	35	31.5	36	32.5	32.5	34.13	35.38
			Muff, Glasses & Adapter	35.5	35	29.5	29.5	30	36	29.5	29	31.13	32.38
			Σ 13	36.3	36	33.8	33.8	31.5	36	31.5	31.3	33.29	34.29
15.3	~1000	Right	Muff	27	27	32	31	33	32	31	30	30.75	30
			Muff and Glasses	28.5	28	25.5	25	31.5	30	30	31	28.87	28.5
			Muff, Glasses & Adapter	27	27	21	21	29	25	31	30.5	27	25.88
			Σ 13	27.5	27.3	26.2	25.7	31.2	29	30.7	30.5	28.9	28.13
17	~1000	Right	Muff	33	33	32	31	34	35.5	34	33.5	33.25	33.25
			Muff and Glasses	33.5	34	34	34	36	33	34	33.5	34.38	33.63
			Muff, Glasses & Adapter	34	33	30	30	36	34.5	31	32.5	32.75	32.5
			Σ 13	33.5	33.3	32	31.7	35.3	34.3	33	33.2	33.46	33.13
15.3			Σ 12	28.65	28.3	26.6	26.45	30.5	28.85	30.7	31	29.12	28.65
17			Σ 12	34.9	34.65	32.9	32.75	33.4	35.15	2.25	32.25	33.38	33.71
15.3	~1000	Left (with Glasses)	Head elevated	24.5	25	24.5	25	30.5	34	31	25.5	27.63	27.38
			Head lowered	27.5	27.5	23	23.5	31.5	35.5	32.5	33	28.63	29.88
			Head turned right	23	23.5	21	21	33.5	36.5	28.5	29.5	26.5	27.63
			Head turned left	30.5	31	26	27	33	33	35.5	35.5	37.25	31.63
			Σ 14	26..	26.75	23.6	24.1	32.1	34.75	31.9	30.9	25.5	29.13
17	~1000	Left (with Glasses)	Head elevated	32.5	33	33	32.3	31	36.5	34.5	34.5	32.75	34.08
			Head lowered	29.5	29.5	31.5	31.4	30.5	35.5	28	32	29.88	32.1
			Head turned right	29	29.5	25	25	30.5	36.5	31	30	28.88	30.25
			Head turned left	34.5	36.5	35.5	35.5	35.5	39.5	35.5	36.5	35.25	37
			Σ 14	31.4	31.9	31.25	31	31.9	37	32.25	33.25	31.7	33.29
15.3	~1000	Right	Head elevated	28	27.5	27	27	32.9	36.9	27	20	28.73	27.85
			Head lowered	26	24.5	30.5	34	32	35.6	27	27.5	28.88	30.4
			Head turned right	27	27	30	28.5	28.5	36.4	29	28.5	28.63	30.1
			Head turned left	27.5	28.5	25	25.5	34	39.4	24	26.5	27.63	29.96
			Σ 14	27.1	26.9	28.1	28.75	31.75	37.1	26.75	25.6	28.43	29.59
17	~1000	Right	Head elevated	24.5	24.5	31	32	36.5	34	33	32	31.25	30.63
			Head lowered	34	32.5	33	33	33.5	35.5	32	32	33.13	33.25
			Head turned right	36	37	34	33	36	26.5	35.5	33	35.38	32.38
			Head turned left	31.5	34.5	32	32	32.5	33	31.5	31.5	31.88	32.75
			Σ 14	31.5	32.1	32.5	32.5	34.6	34.75	33	32.1	32.9	32.86
15.3			Σ 12	26.75	26.83	25.85	26.43	31.75	35.93	29.33	28.25	28.47	29.36
17			Σ 12	31.45	32	31.86	31.75	33.25	35.86	32.63	32.46	32.3	33.08

*Tested while mounted on a Safety Cap + Stop-Gap muff/eyeglass adapter

(Table 8.3):

(1) Head in normal position with an ear muff:

Subject used glasses and adaptors.

(2) Head in four positions:

- Head elevated;
- Head lowered;
- Head turned right; and
- Head turned left.

8.3.4 Test Procedure and Apparatus for Determining the Efficiency of Cup Cushions

The apparatus was made in the Elliot Lake Laboratory. Attenuation was measured at different clamping forces (g wt). The ear cups were exposed to horizontal and vertical signals with a Hewlett-Packard Test Oscillator, Model 650A (Figure 8.2, Figure 8.3, Figure 8.4 and Figure 8.5). Quality of fit shown in Figure 8.2 to Figure 8.5 by area of contacts under different loads (clamping forces).

Machine computation of statistical data was then carried out for these test results.

8.3.5 Test Data and Discussion

The ear attenuation values for ear muffs in both principal versions are shown in tabular form in Table 7.3 and graphically in Figures 8.2, 8.3, 8.4 and 8.5. The measurement results of human heads showed better attenuation on a big head, with an average difference of 4 dBA. A moving head has an insignificantly smaller attenuation. In all cases the attenuation was better in the laboratory, in comparison with the attenuation tests done

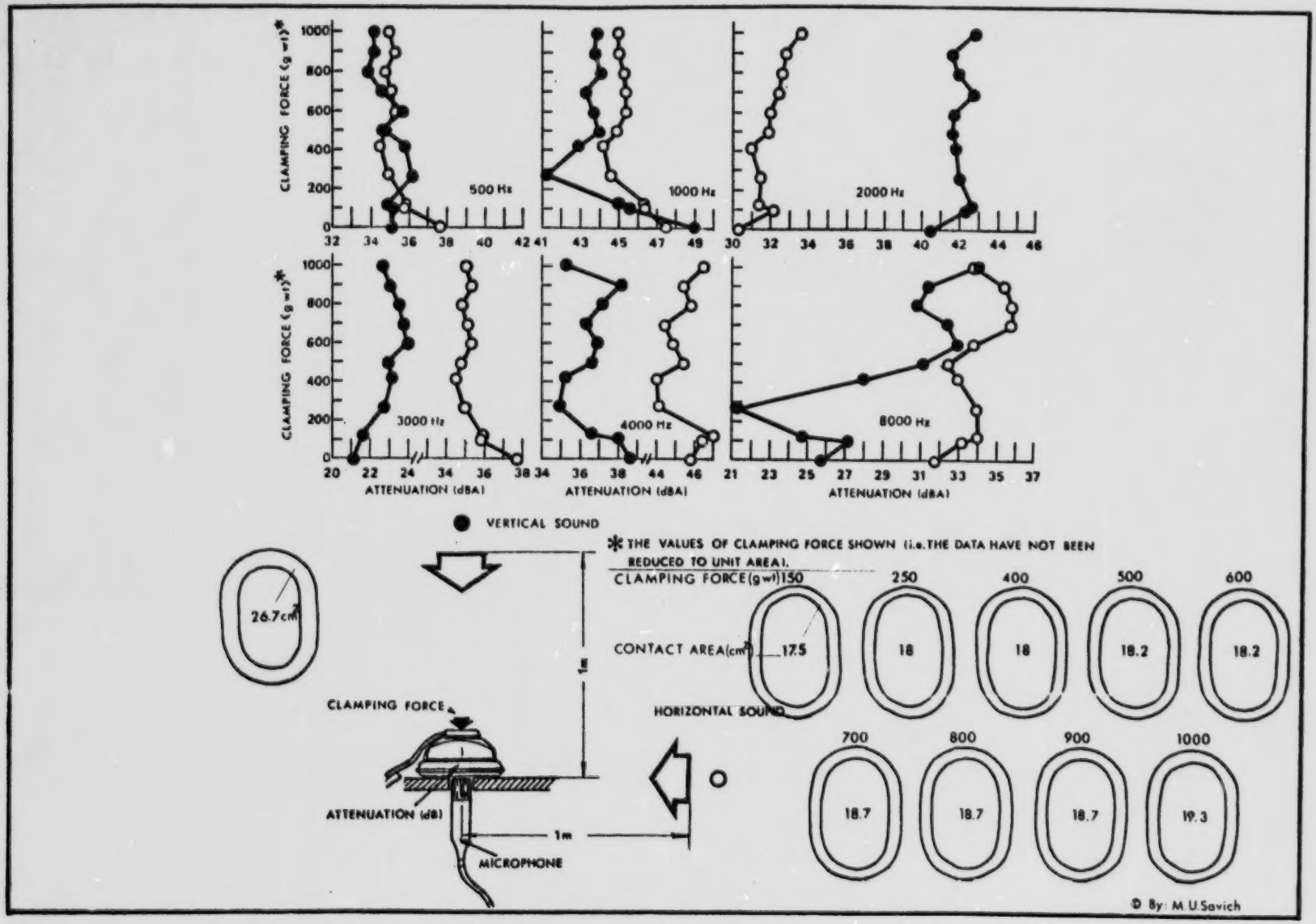


Figure 8.2: David Clark Co., Straightaway, Hearing Protector, Model E-705, No. 1.

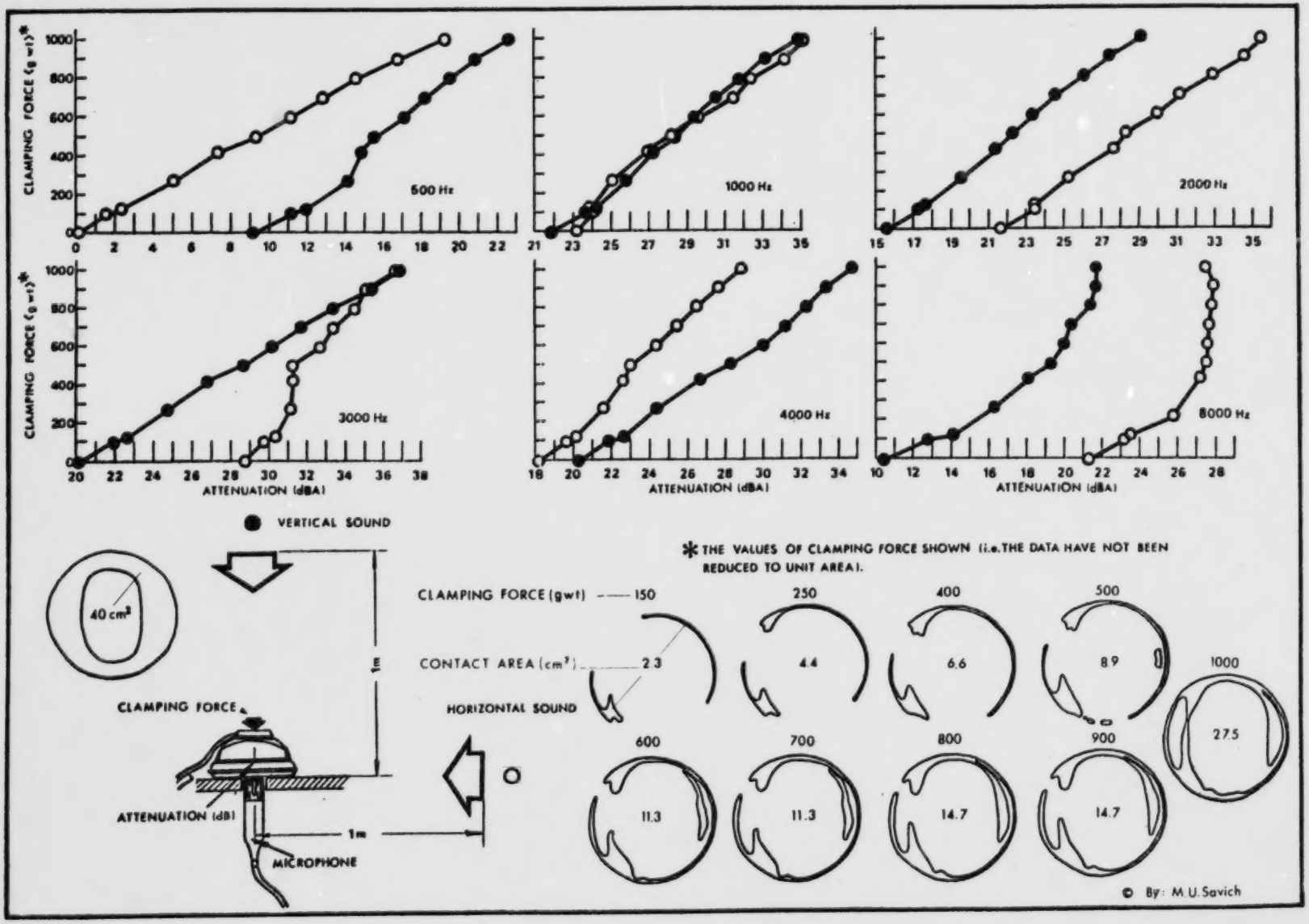


Figure 8.3: American Optical, Hear Guard Model 1775, No. 4.

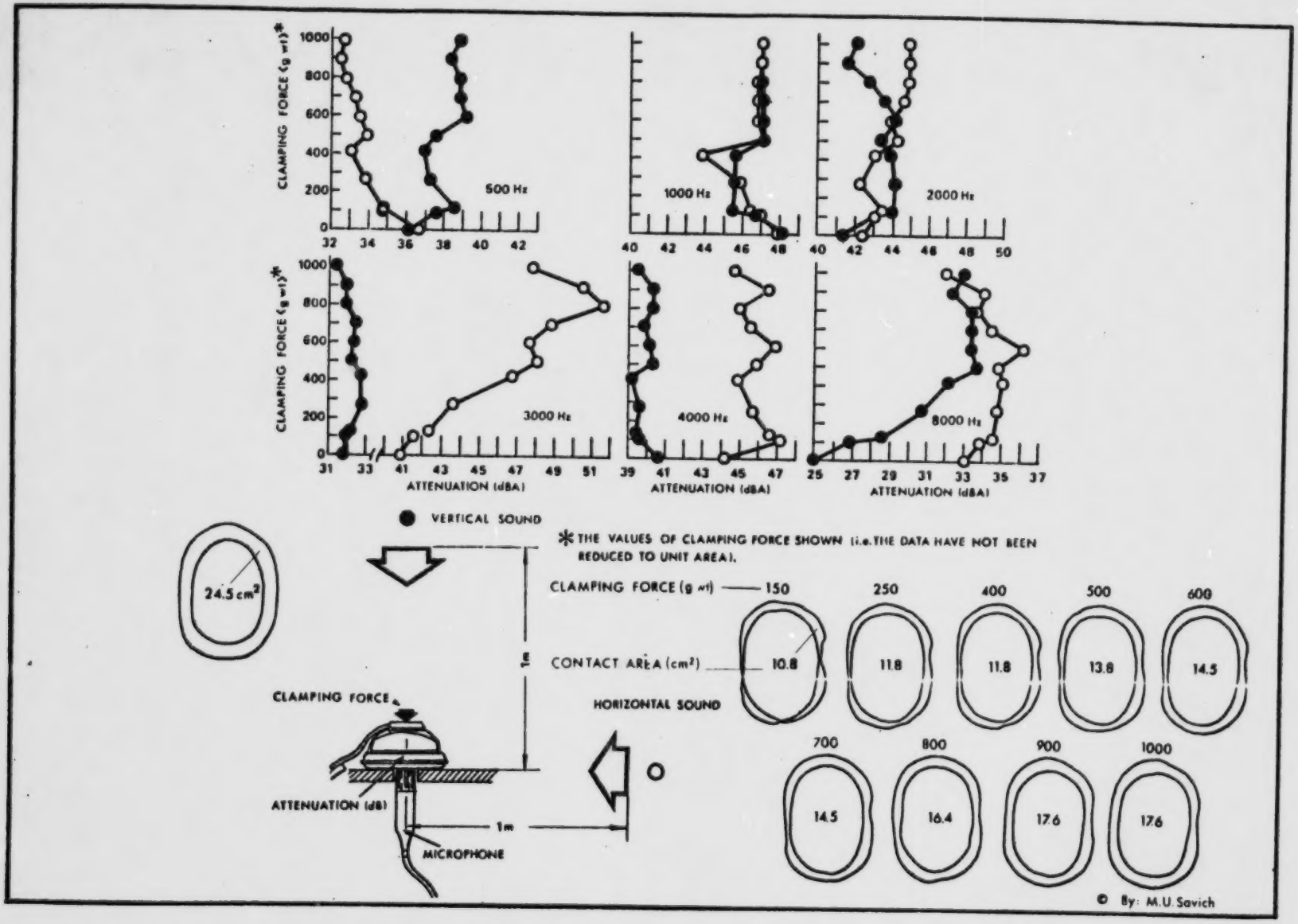


Figure 8.4: David Clark Co., Straightaway, Hearing Protector, Model E-805, No. 6.

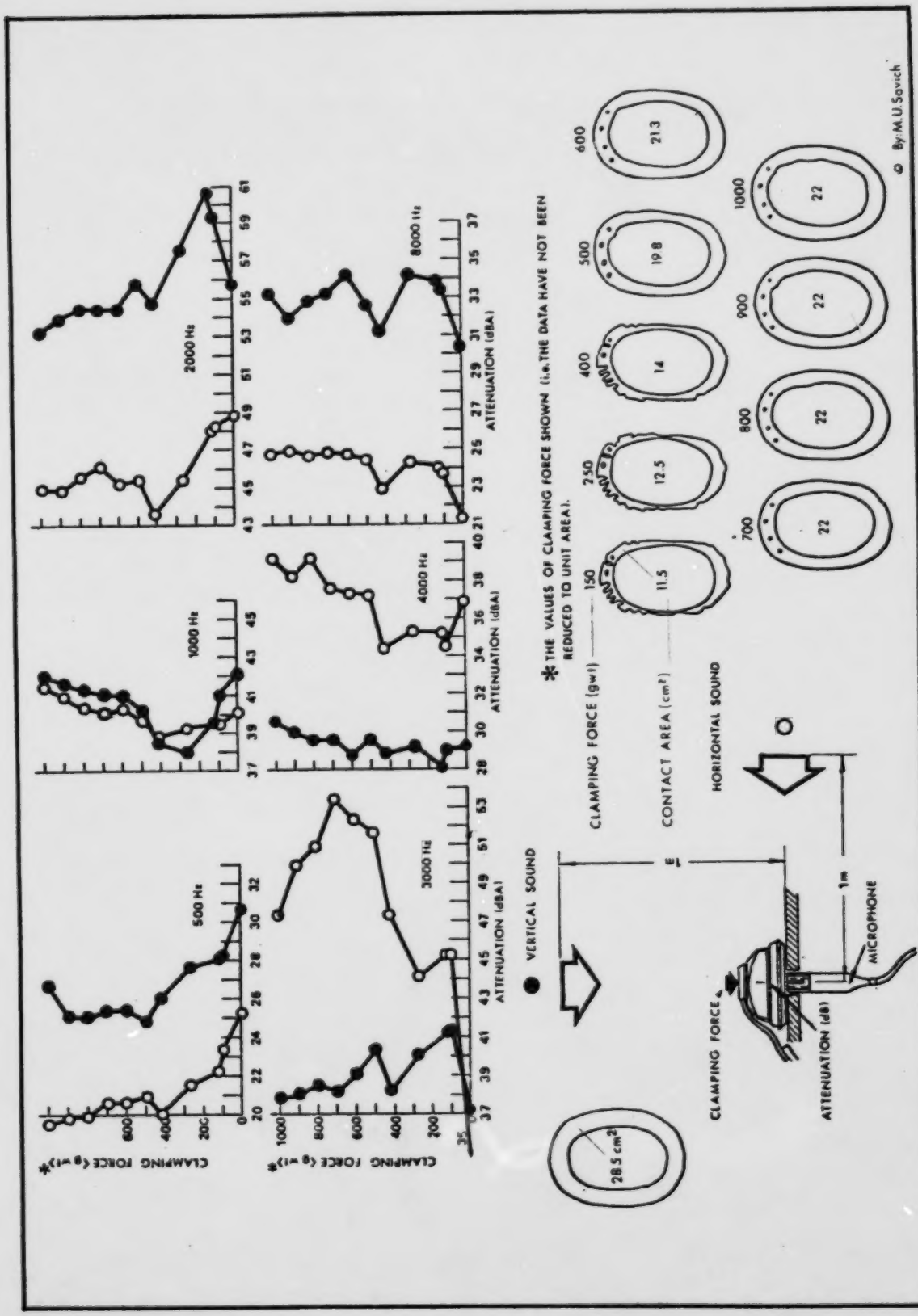


Figure 8.5: Hellberg Protection A.B. No-Noise Ear Cup Kit, No. 8.

in the mines (Table 8.1).

Examination of cup cushion efficiency showed that Straightaway, Model E-705, and Model E-805 hearing protectors were the best (Figure 8.2 and 8.4). Even under a small clamping force these hearing protectors were highly efficient.

The American Optical Hear Guard Model 1775, does not show their advertised characteristics. All tests, including this one, indicated that the above mentioned models performance was not good. Its comfort and appearance, however, was excellent. It is probable that this model was made so that communication requirements would be attained; we did not perform any tests in this area, though. Attenuation comparisons between human heads and the apparatus for efficiency of cup cushions are not in agreement.

From the technical data in Table 8.4, it is evident that the American Optical Model 1775, and the Straightaway Model E-705, have equal weights. The largest cup-volumes are on Straightaway models, and the smallest cup-volumes are seen on Hellberg's NO NOISE Ear Cup Kit.

9. CONCLUSIONS

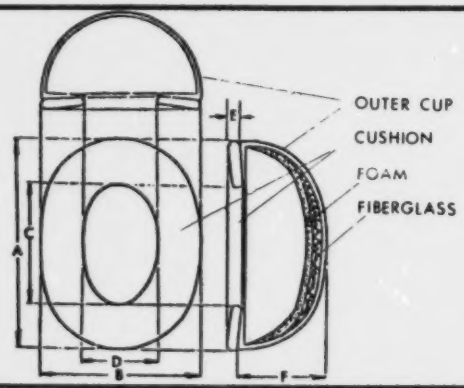
The main problems encountered in noise control of the No. 12 Mine are caused by the difficulty in measuring the exposure index during a full shift and poor wearing of ear muffs.

Monitoring noise with dosimeters and noise classifier:

Testing in the Laboratory was done on commercially available noise

TABLE 8.4

Technical Data of Ear Muffs in No. 12 Mine



No.	Ear Muff	Cross-sectional dimensions (cm)						Area of Cushion (cm^2)	Volume of cup (cm^3)	Weight (g)				Σwt (g)	Note
		A	B	C	D	E	F			Cup	Cushion	Foam	Fiber-Glass		
1	David Clark Co. Ltd., "Straightaway" Hearing Protector Model E-705	9.4	6.9	6.9	4.6	1.0	4.4	26.7	171	73.94	8.92	3.21	-	86.07	Kitle foam - filled ear seals
2	American Optical Hear Guard Model 1775	9.5	9.5	6.5	4.2	0.8	4.8	40.0	159	73.45	11.44	3.90	-	88.79	
3	David Clark Co. Ltd., "Straightaway" Hearing Protector Model E-805	9.4	6.9	6.9	4.6	0.9	4.4	24.5	171	76.26	9.05	3.34	-	88.65	Kitle foam -filled ear seals
4	Hellberg Protection K. B. No Noise Ear Muff Headset	10.6	8.0	6.8	4.2	1.0	3.8	28.0	131	42.80	4.43	1.27	-	48.50	Kitle foam - filled ear seals

dosimeters:

(1) Bruel and Kjaer, type 4425 (3 units).

(2) Gen Rad 1944-9707 Monitor, 1944-9702 Indicator, and 1944-9707 Calibration Adaptor.

(3) Edmont, Model 60-520 (= Quest Electronics, M-6).

(4) Du Pont, Model D-100 Audio Monitor and Model R=150 Readout.

The inhibition at 85 dBA (proposed OSHA Regulation) and 90 dBA (current OSHA regulation) of all instruments was good, except GR-1944 Noise Dosimeter (GenRad property), at 85 dBA and Noise Dose Meter, Type 4425 B and K (Bruel and Kjaer property), at 90 dBA.

In underground field tests, a 166 Environmental Noise Classifier was used. The field tests did not show satisfactory results for the following reasons:

(1) Percentage ranging is too short on all instruments except on the Noise Dosimeter, Type 4425, and on the 166 Noise Classifier. (Both instruments are manufactured by B and K).

(2) The instruments were not designed for underground use. The electronics and packaging of the instruments are not suitable for mine environments.

(3) Positioning of microphones and wearing of instruments constantly produced problems. Breast pockets on the miners' clothing were always either too large or too small, thereby creating a problem for the placing of dosimeters.

Placing dosimeters on belts was considered, but the belts were

too thick for the grooves on the dosi meters. Clamps which were used to fasten cables were often lost. The extension cable broke twice.

(4) It is not possible to evaluate the equivalent continuous sound level, except by using a 166 Noise Classifier, if the level noise does not exceed 115 dBA.

(5) In large mines, like this, one technician must be available full time for testing purposes. Measurement results showed that drillers and haulage operators were exposed to the highest levels of noise. These working areas require better ear protection because tests showed that the present defense systems against noise are inadequate.

All measurements were preliminary.

Diesel Powered Underground Mining Equipment

Legislation has not been introduced to control the noise of vehicles underground. Therefore tests were carried out partially based upon ISO R. 362 Recommendation. This recommendation is based primarily on the moving vehicle test. Also a method measurement for stationary vehicles is given.

The heavy vehicle in mines is mentioned as the major contributor to the noise. Higher and higher performance levels are being required of new underground and open pit haulage vehicles. The performance of components must be raised, and the noise level increases. The operators are exposed to these sound sources. The results of tests show that the

noise levels are high and for this reason the operators must wear ear protectors. The bystanders must wear ear protectors also if working permanently in the vicinity of the haulageway.

Ventilation Systems

Our analysis of the noise produced by fans has focused on the noise levels generated, influence on worker exposure, identification of noise producing components, and noise control treatment.

The goal has been to:

(1) define the problem, and

(2) make short-term solutions for fans currently in use.

Crushing Plants

Noise measurements have shown that quietening of chutes, bins, belts and jaw crushers is necessary in crushing plants (two crushing plants: 1550 ft. level is identical to the one at 2950 ft. level), if these are to comply with the noise exposure limits specified in the OSHA. This report presents the results of an investigation aimed at understanding how noise affects the operator's ears but not how noise is generated and radiated by chutes, bins and machines, and also to provide guidelines for the quietening cost of these items.

Drilling Equipment

(1) Tests have shown that noise is a product of work, and that cycles are repeated.

(2) The sound levels generated by rock drill machinery exceed not only 90 dBA but 115 dBA at the work areas. The provisions of OSHA require

that the operator's exposure be less that 90 dBA over an 8 h. period. All three objectives of noise control, (1) the source, (2) the path, and (3) the receiver, should be applied to quieten machines. In general, achieving these objectives would require sound levels at the operator's ear to be about 88 to 90 dBA. Reviewing the data in Chapter 7, we estimate that the necessary noise reductions are:

25 dBA for the jack leg drills;

21 dBA for the stoper;

18 dBA for the Wills Stope Wagon;

20 dBA for the 630 Stope Jumbo; and

17 dBA for the Jarvis Clark Jumbo (MJM-21)

For further noise attenuations of 15 to 20 dBA ear muffs and ear plugs will be provided.

(3) Diamond drilling machines should be attenuated 5 to 10 dBA only. Raise boring machines are quiet enough and with ear muffs we will obtain safe levels.

(4) During measurements, practice shows that ear muffs do not give desirable attenuations.

Ear Muffs Attenuation

In certain noise areas it is necessary for miners to wear ear protectors, to protect the hearing mechanism. Mining job assignments will determine whether one should wear ear plugs or muffs. Speech and warning signals can be heard with ear protectors. The best ear protector is the one that is properly fitted and worn. Good protection depends on a snug fit. A small

leak can destroy the effectiveness of the protector.

Manufacturers attenuation data of ear muffs are usually presented in the form of mean values and standard deviation for each test frequency band. Calculations involving the direct use of these data are lengthy, and they require that octave band sound pressure level measurements data be recorded from exposure areas. Because of this, it is best, and safe, to measure the attenuation using two noise dosimeters and a stop-watch. On the basis of the obtained values, the L_{eq} can be calculated graphically or by using a ruler. The laboratory tests were performed on only two subjects. The attenuation was measured with two sound level meters, and with microphones placed above and below the ear muffs.

Laboratory tests simulated the actual mine conditions so that the results obtained would be valid in the mines.

The apparatus for determining the efficiency of cup cushions gave good results. The test and the apparatus should be further improved.

From the performed tests, it can be seen that the ear muffs do not give the actual attenuation which had been predicted in the standards. Comfort and appearance have no basic importance for sound level attenuation.

10. RECOMMENDATIONS

A method, using short measurements for the determination of noise exposure index and modes of control for good ear muff wearing should be immediately developed.

Monitoring Noise with Dosimeters and Noise Classifier

(1) During measurements, instruments with built in four digit LED (light emitting diode) display, and 0 to 9999% indication should be used.

(2) Two methods should be compared, and on the basis of the results it be determined which method is better for large and small operations.

1) The Statistical sampling method, proposed by D. O. Conn III, Du Pont (12), with many instruments, and without evaluation of L_{eq} during the sampling period, or

2) Cycle sampling method, proposed by the author (11), with one or two instruments and the possibility of evaluating L_{eq} during sampling periods.

(3) Proposing to the CSA (Canadian Standard Association) to set a standard which should provide the following guide:

a) microphone placement on the body,

b) minimum recommended checks prior to usage, and

c) handling procedures.

Diesel-Powered Underground Mining Equipment

(1) Define the problem:

Engines have been the loudest sound source. Good design of each underground vehicle component, for quietness, will be required to reduce the sound level below 90 dBA. The cab is not a solution in underground mines because the operator's visibility is poor.

(2) Short-term solutions:

1) The noise control program on machines in use should be made

permanent. On the new machines above ground, the noise level could be immediately measured, and the result can be compared with the underground measurements.

2) A methodology should be developed to control the noise of vehicles underground. The test methodology should be carried out partially based upon ISO recommendation.

Ventilation Systems

Short-term solutions:

After installing a new fan, the noise level should be immediately measured, and the results should be compared with the factory results. Short measurements should be taken regularly and the results should be compared with those of the first measurement as a maintenance control and to check on the proper function of the fan.

Long-term solutions:

A methodology should be developed for identifying the room constant, R, of various openings in the mine. Doing so will require making a large number of underground measurements to characterize the acoustic absorption co-efficients, d, of different rocks and the effects of tunnel geometry on sound propagation.

Crushing Plants

In order to quieten crushing plants, the following techniques are recommended (Figure 6.1):

(1) Linings on the impact doors of jaw crushers.

(2) Linings on the chutes of jaw crushers.

(3) The belt pulleys should be permanently greased or changed.

(4) Line the deflector plates of storage bins or redesign the altitude of drop.

(5) Skip bin linings.

(6) Skip linings.

Drilling Equipment

(1) To simplify measurements of the noise exposure index, work measurement cycles can be used.

(2) The purchase of quiet equipment will involve increased costs. The total cost in the final analysis for noise control will be less expensive by purchasing quiet equipment, than if the noise control measures are applied after the equipment is in operation.

(3) Control of noise from new equipment is the responsibility of the manufacturer. In the area of heavy mining equipment there is a need to stimulate manufacturers of pneumatic equipment, compressors, etc.

(4) The feasibility of any engineering control must take into account both economic and practical consideration. The use of engineering specifications requiring noise control may provide the necessary stimulus.

(5) New methods to control ear muff wearing must be found. Attenuations in practice should be the same as theoretical attenuations.

Ear Muff Attenuation

(1) Because of unsatisfactory ear muff attenuation in working conditions, it should be a mandatory requirement that workers wear ear muffs and ear plugs, if the noise level is higher than 105 dBA (in the literature 110 dBA).

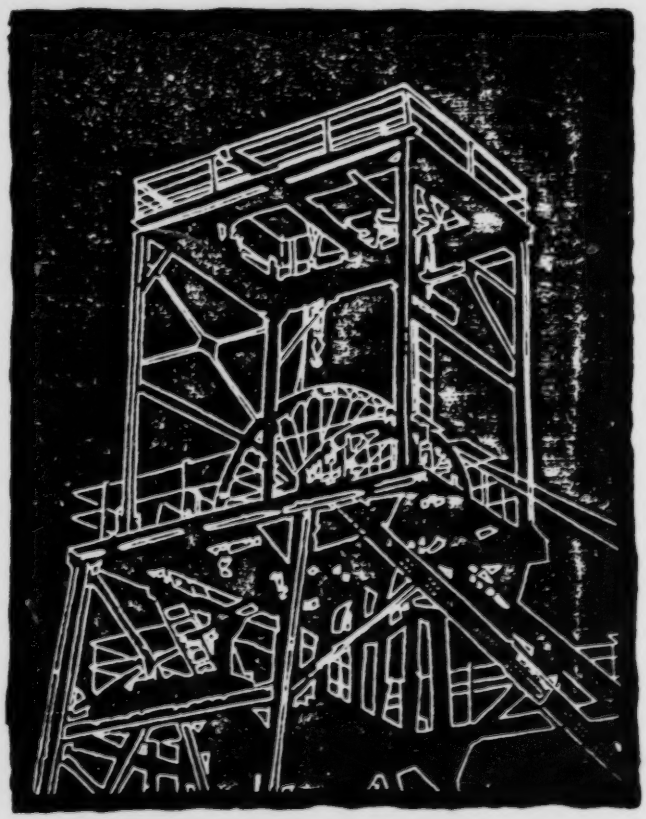
(2) Introduce obligatory tests with two dosimeters and a stop-watch. Into consideration come only two noise dosimeters because of the large microphone size (all other noise dosimeters have inch wide microphones):

Noise Dose Meters, B and K, Type 4424, and

The GR 1954 Noise Dosimeter, Gen Rad.

(3) To convince the employee of the importance of a hearing conservation program requires planning, educational efforts, a persistent control and assistance.

(4) Introduce the program to new miners at the start of employment.



Vignette

11. ACKNOWLEDGEMENTS

J. W. Moerman, Mine Manager, Brunswick Mining and Smelting Corporation Ltd., participated in the development of the project. F. Grebenc, Mine Superintendent, assisted in selecting sampling sites and organizing the tests. M. Fraser, Mine Environmental Control Engineer, R. Cyr, Process Engineer, Noranda Research Centre, Pointe Claire, Quebec, and Dr. W. B. Orser, Mine Medical Officer, participated in making the measurements. J. Dawson, Mine Safety Co-ordinator, was helpful in many ways.

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Appendix 1

ELLIOT LAKE LABORATORY, CANMET, E.M.R.

Noise Survey Form

B & K 166 Environmental Noise Classifier

Test must coincide with full work shift.

Date: Oct. 29, 1975

Time from 8:30 to 15:00

Location: Level 2350

Made by: M. Fraser

Instrument No. _____

Base Line set at 90 dB (normally 90) and Weighting Selector set at _____

Total test time 404 minutes

EQUIPMENT TESTED (SEE OTHER SIDE FOR DETAILS):

ST4A Scoptram

Wagner

Exposure in Minutes												SHEET:
90 to 92 dBA	92 to 95 dBA	95 to 97 dBA	97 to 100 dBA	100 to 102 dBA	102 to 105 dBA	105 to 107 dBA	107 to 110 dBA	110 to 112 dBA	112 to 115 dBA	Over 115 dBA to 120	Over 115 dBA to 125	Exposure Value (%)
										Not Permissible		
										115-117	>117	
11.4	36.3	19.6	19.0	111.1	54.4	31.2	50.8	9.0	1.7	0.3	0.4	
3	15	10.5	40	124	89	67	167	40	10			

1. Enter time in minutes from counters on the 166.
2. Enter Exposure Value (%) from right-hand column corresponding to minutes in table.

Number of personnel exposed: 1

Wearing ear protection? ☒ yes ☐ no

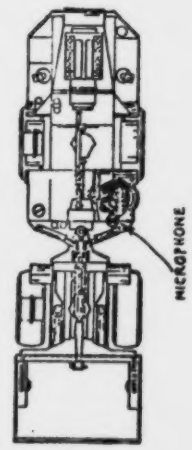
3. Add Exposure Values 565 = % Permissible Exposure

4. Divide % Permissible Exposure by 100 to obtain OSHA Mixed Exposure Index 5.65

SIGNED: Hiroaki Tanaka

RECOMMENDATION: Note: Equivalent Continuous Sound Level, Leq = 104 dBA

ELLIOT LAKE LABORATORY, CANMET, E.M.R.



Sketch showing microphone locations, orientation of the subject, distance from subject to microphone, and height of microphone above reflecting plane (direction of exhaust and size of load cell where applicable). Show measuring location with an X.

SUBJECT:

Model: ST-4A Manufacturer: Wagner Serial: _____

Rated Speed and Capacity: 4.0 Cu. Yds.

Description: Scoptram: Load-Haul-Dump vehicle. Low profile 4 wheel drive completely articulated operation, articulated steering. Deutz air-cooled diesel engine.

TECHNICAL DATA:

Steel type: _____ Water Pressure Supplied: _____ bars

Length: _____ metres Airflow: _____ m³/min

Bit Type: _____ Blow rate: _____ blow/min

Muffler Type: _____ Penetration: _____ m/min

Air Pressure Supplied: _____ bars Rock Type: _____

NOTES: All Wagner mining vehicles are manufactured in accordance with the United States Bureau of Mines Schedule 24.

LOCATION: Brunswick Mining, No. 12 Mine, Crusher Operator 2950' Level

NOISE SURVEY FORM

METHOD OF CALCULATING OSHA MIXED EXPOSURE INDEX

ELLIOT LAKE LABORATORY, CAN-MET, E.M.R.

SHEET: 2
DATE: Nov. 15, 1975

% / dBA	10	20	30	40	50	60	70	80	90	100	OVER 100%
115			5min				10min			¼ hr	
110			10min				20min			½ hr	
105			20min		30min		40min		50min	1 hr	
102			30min				1hr			1½hr	
100					1hr					2 hr	
97			1hr				2hr			3 hr	
95					2hr			3hr		4 hr	
92		1hr	2hr		3hr		4hr		5hr	6 hr	
90	1hr	2hr	3hr		4hr	5hr	6hr		7hr	8 hr	

ADD EXPOSURE VALUES

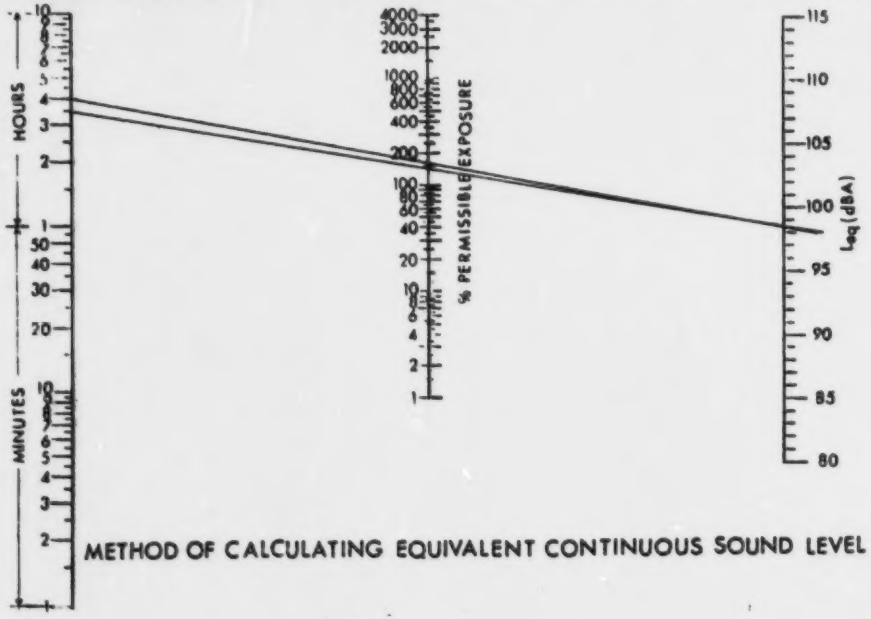
146
163

% PERMISSIBLE EXPOSURE
DIVIDE BY 100
TO OBTAIN

1.46
1.63

OSHA
EXPOSURE INDEX

Σ TIME	Hours	Minutes	
	3	30	OSHA
	4	00	



METHOD OF CALCULATING EQUIVALENT CONTINUOUS SOUND LEVEL

The equivalent continuous sound level → Leq = 98.4 / 98.4 dBA

INSTRUMENT: Sound Level Meter Type 2209, B&K and Level Recorder Type 2306, B&K

RECOMMENDATIONS: .....

Note: Jaw Crusher, 200 hp, 500 t/h, 60" Jaw

SIGNED: Airay Saich

2A

Appendix 2

STUDY # 1157

Standard Times

Set-Up	6.35	
~~Drilling~~ Operate	328.71	
Drilling		
Tear down		
	335.36	①

Standard / Bolt

Set-Up	0.02	
~~Drilling~~ Operate	10.16	
Drilling		
Tear-Down		
	10.18	minutes / ~~bolt~~ test @ 30'

Drilling

Drilling

DATE: Nov. 4/75	WORK STUDY RECORD ②	FILE: 1157
LOCATION: 1980 F-1H FW	OPERATION: Diamond Drilling	OBSERVER: L. [illegible]

OPERATION DESC. SUB OP. DESC.	PRODUCTION DETAILS	POSTED TO OP. NO.
Average penetration rate of 3.12"/minute at an average air pressure of 40.8 P.S.I.		
A total of 30' was drilled during the shift.		
Amounts of methane were detected from the F.C.H.		
A Boyle's compressed air diamond drill was used with 1¾" Core Bit rods 6' in length.		

E.G. - NO. OF UNITS
EQUIPMENT AND SIZE
DISTANCES
JOB COMPLETE OR INCOMPLETE
START POINT AND DESTINATION

Study No. 1157

DELAY TIMES ③

DELAYS

Travel	112.10		
Lunch	78.72		
Mechanical			
Supervision	2.80		
Planning	12.77		
Other work			
Miscellaneous	14.41		
	220.80	220.80	Sub Total

OPERATING TIME

Set-Up	4.20		
~~Drilling~~ Operate	225.47		
Mucking			
Tear down			
Personal	3.65		
U.T.			
	233.40	233.40	Sub Total
		457.20	Total

Shift duration from ~~8:06 AM~~ to 8:48 PM

Total minutes = 457

3A

Appendix 3/1

Appendix 3/2

TABULATION SHEET — STUDY NO.: 1154 — PAGE: 1 OF 4
TOTAL H.T.: — AV. P.R.: — TOTAL S.T.: — SUB-OPERATION: Set-Up — POSTED TO: 4

Prepare Site				Put on b.t				Start-Unit							
OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.
1	125	125	125	1	115	115	115	1	115	52	140	1			
2				2				2		132	1410	2			
3				3				3				3			
32	1			32				32				32			
	125	125	125		115	115	115	2	115	184	1550				
		172				143				316					
		118				124				216					

TABULATION SHEET — STUDY NO.: 1154 — PAGE: 2 OF 4
TOTAL H.T.: — AV. P.R.: — TOTAL S.T.: — SUB-OPERATION: Operations — POSTED TO: 5

Drilling				Retract Rod				Remove core				Place core in box			
OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.
1	125	125	125	1		1327	1725	1	111	1125	1125	1	112	125	125
2				2		1326	1725	2				2		115	115
3		122		3				3		121	121	3		125	125
4				4				4		1	1	4		3-4	1725
5				5				5		115	115	5		4	1725
6				6				6				6			
7				7				7		1	1	7		1	1
8				8				8				8		5-1	1425
9				9				9				9			
10				10				10				10		52	1725
11				11				11				11			
12				12				12				12			
13				13				13				13			
14				14				14				14			
15				15				15				15			
32	1			32				32				32			
19	125	111	125	2	115	1281	1325	1	113	1225	125	11	117	125	125
						1281				1327					
		1279				4417				1281				2521	

TABULATION SHEET — STUDY NO.: 1154 — PAGE: 3 OF 4
TOTAL H.T.: — AV. P.R.: — TOTAL S.T.: — SUB-OPERATION: Operations — POSTED TO: 6

Insert Rods				Address Test				Inspect				Remove Core			
OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.
1	125	1124	1425	1	115	504	135	1	115	81	140	1	115	502	1425
2		824	1425	2		52	135	2				2		421	125
3		1121	1425	3				3				3			
4		228	125	4				4				4			
5		1-1	125	5				5				5			
6		1-1	125	6				6				6			
7		1-1	1425	7				7				7			
8				8				8				8			
32	1			32				32				32			
4	125	1124	1425	2	115	556	135	1	115	81	140	2	115	502	1425
	5107	9129				461				29				923	
	1231	5747				985				33				1166	

TABULATION SHEET — STUDY NO.: 1154 — PAGE: 4 OF 4
TOTAL H.T.: — AV. P.R.: — TOTAL S.T.: — SUB-OPERATION: Operations — POSTED TO: 7

Place core in box				Casing with a Block				Trip core box							
OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.	OCC.	R.A.	E.T.	P.R.
1	115	42	125	1	115	32	135	1	115	442	125	1			
2				2				2				2			
32	1			32				32				32			
1	115	42	125	1	115	32	135	1	115	442	125				
		34				104				664					
		68				147				642					

DATE: Nov. 4/75 — TIME STUDY SHEET — FILE: 1154
LOCATION: 1980 F-1 N FW — Diamond Drilling — R.C. SAVAGE
PAGE: 1 of: —

	ACTIVITY	P.R.	W.T.	O.T.	ACTIVITY
Rods - Goya 10ms 88 BRM (Mathews)	Travel		3320	1320	10'-Rods
184 PSI	Gas Test	135	9425	581	
	Misc.		5710	2274	Install Pin mark
Air - Side 1"	Prepare Site	120	5496	132	
Core - 5° W	Misc.		102		
	Insert Rods	135	1201	169	
	Connect to chuck (rod)	140	1496	135	
2m 4772'	Retract		3432	39	
	Inspect (pump)	120	4762	92	
	Personal		1189	58	
	Start Unit	140	2839	58	
68 PSI	Drilling		2952	463	
	Flush out cuttings	135	3120	168	
	Drilling		1282	211	
	Cutting wireline 1/2	136	3178	98	2-3-0 Co-ordinates
	Drilling		3532	157	
	Gas Test	135	3582	62	
	Drilling		7080	1374	
	Add Rod	135	7512	274	5'
	Start Unit	140	5483	124	Turn on pump, rebuild
Test for outflow	Drilling		5595	1108	Ready to Start
	Reset Chuck	120	5615	60	
92 PSI	Planning		872	277	Check with foreperson
	Drilling		1167	1135	
	Reset Chuck	135	2450	103	
	Flush out cuttings	115	2320	109	
	Flush out cuttings	130	2982	153	
	Retract Rods	135	3812	1330	
	Remove core	125	4420	548	10'
	Place core in box	120	4465	45	
	Place Diamond bit	125	4589	119	
91 PSI	Insert Rods	135	5878	1469	
	Personal		1966	38	
	Insert Rods	130	158	8	
	Supervision		2170	280	
	Leach		2210	1240	
	Planning		4772	117	Move control +
	Flush out cuttings	135	3501	1329	Work Rig

DATE: Nov 4/75 — TIME STUDY SHEET — FILE: 1150
LOCATION: 1980 F-1 N FW — Diamond Drilling — R.C. SAVAGE
PAGE: 2 of: —

ACTIVITY	P.R.	W.T.	O.T.	ACTIVITY
		3901		
Drilling		3726	1470	
Reset chuck	135	3833	97	
Flush out cuttings	125	3916	91	
Drilling		4946	1029	
Reset Chuck	135	5073	153	
Flush out cuttings	125	5193	138	
Drilling		293	1100	
Add Rod 5'	135	502	209	
Flush out cuttings	145	589	87	
Drilling		1800	1211	
Reset Chuck	140	1905	105	
Flush out cuttings	130	1995	90	
Drilling		3213	1218	
Add Rod	135	3430	217	
Flush out cuttings	130	3540	110	
Drilling		3941	1401	
Add Rod 5'	135	4345	404	
Flush out cuttings	135	4398	53	
Drilling		5817	1419	
Reset Chuck	135	5940	123	
Drilling		5915	472	
Retract Rods	135	6272	1357	542'
Remove core	130	6463	691	10'
Trip core box	135	6410	947	
Travel		7320	2110	Finish 2 to PM.
				Gage-up 145 PM.

ELLIOT LAKE LABORATORY, CANMET, E.M.R.

Plant-Noise Survey Form

DATE: November 5/1975
METER #: Sound Level Meter Type 2309 Bak, and Level Recorder Type 2806

LOCATION: 7N Bore Hole - 1900'
Brunswick Mining, No. 12 Mine

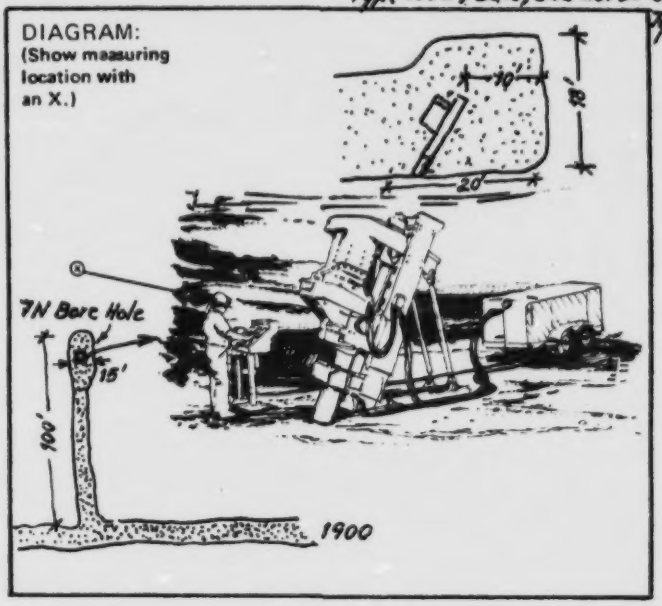
NUMBER OF PERSONNEL EXPOSED: 2

WEARING EAR PROTECTION? [X] yes [ ] no

OPERATOR: J. C. Roy
– Security 480 –

Equipment: Raise boring machine
Manufacture: "Dresser Industries Ltd."
Steel type: Cutter – 6.6 Feet Diameter
Length (m.):
Bit type:
Muffler type:
Air kPa:
Water kPa:
Airflow m³/min:
Blow rate (blow/min.):
Penetration m./min.: ~ 0.007
Rock type:

DIAGRAM: (Show measuring location with an X.)



NOTES:

	dBA MAX LEVEL	EXPOSURE TIME If necessary, note time of day	TOTAL DURATION IN HOURS PER DAY (C)	PERMISSIBLE HOURS PER DAY (T)	C/T
MAXIMUM LEVELS AS MEASURED ON THE "A" SCALE OF THE SOUND-LEVEL METER. IF THE READING IS BETWEEN LEVELS SPECIFIED, USE THE HIGHER LEVEL.	OVER 115			NONE	
	115			¼	
	110			½	
	105			1	
	102			1½	
	100			2	
	97	0.82	0.82	3	0.27
	95	1.12 + 1.12 + 1.37	3.61	4	0.93
	92	0.63	0.63	6	0.11
	90			8	
	UNDER 90			ANY	0
IMPACT CHECK (MUST BE UNDER 140 dB PEAK SOUND PRESSURE LEVEL AS MEASURED WITH AN IMPACT NOISE ANALYZER OR BE UNDER 121 dB AS MEASURED WITH A SOUND-LEVEL METER ON C WEIGHTING, FAST RESPONSE, 140 dB FULL SCALE RANGE.	MAX - dB(C)	L_{eq} = 95.3 dBA	5.06	TOTAL	1.31

To comply with regulations, total cannot be more than 1.

RECOMMENDATIONS:

SIGNED: Adrian Savich

80-26 M. Savich, J. Vincent, and P. Park

Noise Measurement in Quirke No. 2 mine,

Rio Algom in Elliot Lake

1980

MESURES DU BRUIT À LA MINE QUIRKE N^{O} 2 DE LA RIO ALGOM À ELLIOT LAKE

M. Savich*, J. Vincent** et P. Park+

RÉSUMÉ

Des mesures de l'exposition au bruit ont été effectuées à la mine Quirke n^{O} 2 de la Rio Algom à Elliot Lake, en vue de déterminer les niveaux de bruit aux sites d'exploitation et de déterminer les possibilités futures en matière de protection de l'ouïe. Les exigences de l'OSHA ont été utilisées comme guide pour la réglementation en matière d'émission de bruit. On a fait des mesures de l'indice d'exposition au bruit (IEB) pendant un quart complet et sur la base du cycle de travail. On a étudié l'atténuation offerte par les serre-tête antibruit utilisés dans la mine. Les méthodes de CANMET ont été appliquées pendant ces mesures. Elles sont simples, ne nécessitent pas un accroissement de la main-d'oeuvre, et permettent la transmission immédiate des résultats complets aux travailleurs.

Les résultats des mesures montrent que 61 % des travailleurs sont exposés à des niveaux de bruit de 90 à 118 dBA (valeur actuelle de l'OSHA), 78 % sont exposés à des niveaux de 85 à 118 dBA (valeur en suspens de l'OSHA) et 90 % sont exposés à des niveaux de bruit de 80 à 118 dBA (valeur envisagée pour l'an 2000). Ces résultats montrent que la direction devrait adopter des mesures opportunes.

Mots clés : bruit, mesure, exposition, ventilateur, serre-tête antibruit, mine.

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NOISE MEASUREMENTS IN QUIRKE NO. 2 MINE, RIO ALGOM IN ELLIOT LAKE

by

M. Savich*, J. Vincent** and P. Park+

ABSTRACT

Noise exposure measurements were performed in Quirke No. 2 Mine, Rio Algom in Elliot Lake, to determine the noise levels at operation sites, and to determine future prospects for hearing conservation. OSHA requirements were used as a guideline for the regulation of noise emission. Noise exposure index measurements (NEI) were carried out for a full shift and on the basis of the work cycle. Attenuation of ear muffs used in the mine was examined. CANMET's methods were applied during these measurements. These methods are simple, they do not require an increase in manpower and the principle of providing full information of results to workers is immediate.

Measurement results show that 61% of the workers are exposed to noise levels of 90 to 118 dBA (present OSHA), 78% are exposed to noise levels of 85 to 118 dBA (OSHA pending), and 90% are exposed to noise levels of 80 to 118 dBA (outlook for 2000). This shows that management should adopt timely measures.

Key words: Noise, Measurement, Exposure, Fan, Ear Muff, Mine.

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CONTENTS

ABSTRACT i
1. INTRODUCTION 1
2. STANDARDS FOR OCCUPATIONAL NOISE EXPOSURE 1
3. UNDERGROUND MEASUREMENTS: INSTRUMENTS AND TECHNIQUE 3
3.1. Instruments 3
3.2. Measurement Technique 4
4. NOISE EXPOSURE INDEX 4
4.1. Work Day Noise Exposure Index 4
4.2. Cyclical Measurement of Noise Exposure Index 10
4.3. Influence of Fan Noise in Raising the Exposure Index 14
5. NOISE SURVEY OF CRUSHING AND GRINDING OPERATIONS AT PANEL MINE . 19
6. ATTENUATION CHARACTERISTICS OF EAR MUFFS AT QUIRKE, NO. 2 MINE . 20
7. CONCLUSIONS AND RECOMMENDATIONS 20
8. ACKNOWLEDGEMENTS 25
9. REFERENCES 25

TABLES

1. Threshold limit values continuous or intermittent noise ISO and OSHA 2
2. Statistical data of measurements in Quirke No. 2 mine 6
3. Summary of the equivalent continuous sound levels and ear protection data 7
4. Main causes of noise in Quirke No. 2 mine, grouped according to equipment and operation 8
5. Summary of cyclical measurements of the equivalent sound level and ear protection data 12
6. Comparison between full-shift and cycle measurements of the equivalent continuous sound levels 14
7. Summary of short time measurements of the equivalent sound level and peak sound pressure level of different fans 16
8. Measurements of noise from fans (24" Woods) 18
9. Noise levels in crushing and grinding plants at Panel Mine 19
10. Attenuation of ear muffs at the Quirke No. 2 mine 21

FIGURES

1. The Noise Monitor Gun in use during underground operation 5

2. Bar diagram of the equivalent continuous sound level (L_{eq}) using OSHA criteria 9

3. Method of calculating equivalent continuous sound level 11

4. Bar diagram of the cycle measurements of the equivalent continuous sound level, and the peak sound pressure level 13

5. Bar diagram of the short time equivalent continuous level (L_{eqs}) and peak sound pressure level (SPL) of noise from fans..... 17

6. Cross-payment flow diagram: improving noise environmental control 23

APPENDICES

1. Results of work day noise exposure A26

2. Results of cyclical measurement of noise exposure index (short measurement) A31

3. Results of short time measurements of the equivalent sound level peak sound pressure level of different fans A39

1. INTRODUCTION

The Noise Exposure Index (NEI) measurements program is being conducted by the Elliot Lake Laboratory, CANMET, in local mines. Discussions with Rio Algom indicated a common interest in assessing noise, thus a joint program was established.

The objective of industrial noise control and hearing conservation programs is to protect employees from permanent hearing loss in the speech frequency range. Noise measurement in Quirke No. 2 Mine is directed towards the following objectives:

1) to identify the main underground job categories by noise exposure index (dosimetry);
2) to measure cyclical noise, as is often the case in mines: to extrapolate the noise exposure index from a few machine cycles. The correlation of the total days' noise dose and cycles measurement noise dose can be found; and
3) to establish the effectiveness of ear muffs used in mines.

The scope of this report is to establish the best and least expensive method for assessing noise in Quirke No. 2 Mine.

2. STANDARDS FOR OCCUPATIONAL NOISE EXPOSURE

Standards for occupational noise exposure are not uniform in Canada. British Columbia uses criterion ISO* R 1999 Assessment of Occupational Noise Exposure for Hearing Conservation Purposes. The United States and other parts of Canada use a slightly different criterion from Occupational Safety and Health (OSHA). Both criteria prescribe a maximum continuous exposure level of 90 dBA in the work environment (Table 1). Below 90 dBA, ISO controls exposures down to 80 dBA. OSHA sets no limits below 90 dBA, but a proposal

---

* International Organization for Standardization.

Table 1 - Threshold limit values continuous or intermittent noise ISO and OSHA.

	ISO Noise Dose %	dBA	OSHA Max Time h-min	
8 h	10	80		
	15	82		
	20	83		
	25	84		
	30	85	16-0	Pending
	40	86	13-56	
	50	87	12-8	
	60	88	10-34	
	80	89	9-11	
	100	90	8-0	
q = 3	125	91	6-56	q = 5
	160	92	6-4	
	200	93	5-17	
	250	94	4-36	
	315	95	4-0	
	400	96	3-29	
	500	97	3-2	
	630	98	2-50	
	800	99	2-15	
	1000	100	2-0	
	1250	101	1-44	
	1600	102	1-31	
	2000	103	1-19	
	2500	104	1-9	
	3150	105	1-0	
	4000	106	0-52	
	5000	107	0-46	
	6300	108	0-40	
	8000	109	0-34	
	10000	110	0-30	
	12500	111	0-26	
	16000	112	0-23	
	20000	113	0-20	
	25000	114	0-17	
	31500	115*	0-15	

* No exposure to continuous or intermittent excess of 115 dBA.

Note: Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level (OSHA).

is pending to extend control by lowering it to 85 dBA. Table 1 shows that allowable exposure time is halved for each 3 dBA increase in noise level under ISO and for each 5 dBA increase under OSHA. The 3 and 5 dBA interval is called the "trading ratio" or the "q" (coefficient) in the equation.

These two criteria also differ in how they block out work periods. ISO permits averaging exposure over a 40 hour work week, but OSHA permits averaging over just an 8-hour work day.

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered to exceed the threshold limit value.

3. UNDERGROUND MEASUREMENTS: INSTRUMENTS AND TECHNIQUE

The measurement of noise levels and noise exposure index should be associated with a noise control problem in a mine and mill. CANMET's technique and experiences were applied.

3.1. INSTRUMENTS

Peak noise measurements were performed with a 1565 sound level meter, GenRad, conforming with the American National Standard Specification for Sound Level Meters S1.4(1971) Type S2A.

For a miner's daily noise dose, the 1944-9707 noise exposure monitors, GenRad, were used (3 units). The monitors were plugged into 1944 Noise Exposure Indicator, GenRad, and a readout showed a percentage of OSHA limits and indicated when 115 dBA was exceeded. Only one indicator is required for any number of monitors.

Four Noise Dose Meters, Type 4425, Brüel and Kjaer, were used to measure exposure and to indicate when 115 dBA was exceeded. For maximum accuracy the microphone should be remotely located on the shirt collar, or on a hat

near the ear. One unit was specially adapted, the "noise monitor gun", to survey, within a day, many work stations, and it has the advantage that measurements are supervised at all times (Fig. 1).

3.2. MEASUREMENT TECHNIQUE

For full-shift measurements of the NEI, six instruments were on disposal, and for cycle measurements of the NEI, one instrument was used.

In ten weeks (4 days a week) with five dosimeters (from the six, one was usually calibrated and serviced) two hundred measurements of the NEI (full-shift) had to be made. However, only 151 measurements were taken (Table 2). A larger number of readings were taken only with one noise gun: 182 in places of operation and 95 on fans.

4. NOISE EXPOSURE INDEX

The noise exposure index was measured during full shift, and cycles (short measurement).

4.1. WORK DAY NOISE EXPOSURE INDEX

Finished measurements of work day noise exposure doses are displayed in Appendix 1.

The microphone of the noise dosimeter was worn on the breast pocket, over and under ear muffs. The NEI varies slightly with individual occupational categories. Drillers and their helpers are exposed to the highest noise levels. 77.6% of the noise levels in all occupations exceeded 115 dBA (Table 3). In Table 3 values are worked out in the equivalent continuous noise level (L_{eq}) for easier comprehension of the overall problem. Because the number of tests is still small, only general conclusions can be made.

48.3% of all employees use ear muffs, and 39.1% use ear plugs. Only

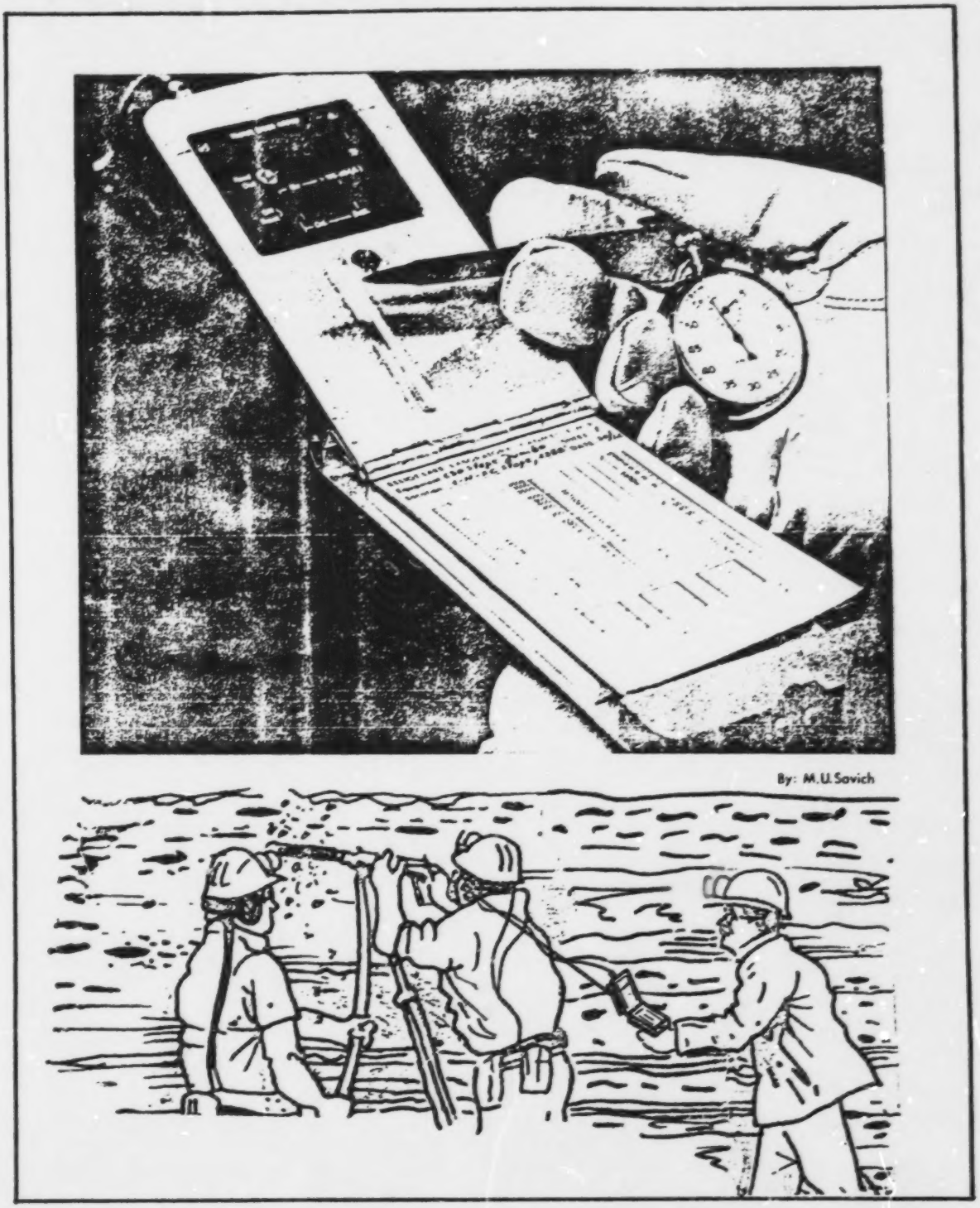


Fig. 1: The Noise Monitor Gun in use during underground operation.

Table 2 - Statistical data of measurements in Quirke No. 2 Mine

Operation	No. of Men	Noise Exposure Test No. of Men			Percent Tested of Total		
		Shift	Cycles	Σ	Shift	Cycles	Σ
Trackless Mining	70	32	28	60	45.7	40	85.7
Jumbo Operator		10	12	22			
LHD Operator		9	11	20			
Rockbolter		8	5	13			
Miscellaneous		5	-	5			
Conventional Mining	394	64	130	194	16.2	33	49.2
Driller	231	39	70	109	16.9	30.3	47.2
Slusherman	102	12	41	53	11.8	40.2	52
Haulageman	44	9	19	28	20.4	43.2	63.6
Trackman	17	4	-	4	23.5	-	23.5
Mining Services	195	29	17	46	14.9	8.7	23.6
Mechanics	72	9	-	9	12.5	-	12.5
Electricians	25	3	-	3	12	-	12
Pipefitter	27	4	-	4	14.8	-	14.8
Level Serviceman	23	6	3	9	26.1	13	39.1
Timberman	23	2	-	2	8.7	-	8.7
Diamond Driller	4	4	7	11	100	175	275
U/G Crusherman	5	1	7	8	20	140	160
U/G Instructor	16	-	-	-	-	-	-
Shaft	9	3	7	10	30	77.8	111.1
Skip Tender	5	2	7	9	40	140	180
Cage Tender	4	1	-	1	25		25
Supervisory & Technical	67	23	-	23	34.3	-	34.3
Shift Boss	40	9	-	9	22.5	-	22.5
Ventilation	4	6	-	6	150	-	150
Surveyors	17	4	-	4	23.5	-	23.5
Geologists	6	4	-	4	66.7	-	66.7
TOTALS	735	151	182	333	20.5	24.8	45.3

Table 3 - Summary of the equivalent continuous sound levels and ear protection data.

No.	Occupation	No. of Samples	L_{eq} (dBA)						Exceeded 115 dBA		Percent of Total				
			Breast Pocket		Over Muff		Under Muff								
			Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Yes	None	Plugs	Muffs	Plugs & Muffs	Questionable	None
1	Jumbo Operator	10 (8, 1, 1)	100.23	2.25	102.5		95		5 1 1	3	30	70			
2	L.H.D. Operator	9 (8, 1)	100.81	1.37	97				7 1	1	44.4	56.6			
3	Rockbolter	8 (5, 3)	99.45	3.18	101.83	15.01			3 2	1	50	37.5			12.5
4	Other	5 (2, 3)	95.50	13.86	98.1	16.07			1 2	1 1	60	40			
5	Driller	30 (18, 1, (2) 11)	105.8	10.43	107.3		95.52	8.12	18 1 10	1	15.6	75	9.4		
6	Driller (Helper)	7 (2, 1, 4)	108.2	2.12	109		106.63	9.43	2 1 4		14.3	71.4	14.3		
7	Slusherman	12 (6, 3, 3)	85.77		<80		<80		5 3 1	1 2	33.3	58.4		8.3	
8	Haulageman	9 (5, 3, 1)	86.23	5.56	91.54	6.11	86		2 4 1		88.9	11.1			
9	Trackman	4 (1) (1, 1, 1)	81		91.6		87.1		1 1 1		25	25		50	
10	Mechanics	9 (3, 6)	80.15	0.21	93.45	12.15			1 5	2 1	66.7			33.3	
11	Electricians	3 (3)					83.9	6.16	3			100			
12	Pipe Fitter	4 (2, 1) (1)	85	7.07	87				1 1	1	25	25		50	
13	Level Service	6 (2, 4)	87.5	3.54	83.03	3.58			1 2	1 2	50	16.7		33.3	
14	Timberman	2 (1, 1)	90		89				1 1		50			50	
15	Diamond Driller	4 (1, 3)			98.3		83.67	4.62		1 3	100				
16	U/G Crusher	1 (1)			100				1		100				
17	Skip Tender	2 (1, 1)	85		82.5					1 1	100				
18	Cage Tender	1 (1)	85							1				100	
19	Shift Boss	9 (2, 6, 1)	<90		84.28	3.36	<80		1 5	1 1	77.8	11.1		11.1	
20	Ventilation Tech.	6 (1) (1, 1, 3)	91		110		86.93	9.67	1 1	1 2	16.7	83.3			
21	Surveyor	4 (1, 1, 2)	101.5		82.6		85.5	2.12	1 2	1		75	25		
22	Geologist	4 (4)					87.8	8.88	3	1		100			
		181	← Percent of Total →						77.6	22.4	37.1	48.3	3.3	8.6	0.7

3.3% of the work force use both. Rare is the occasion when a miner uses no protection or rejects it. One such case of a rock bolter is recorded (Table 3).

A grouping, by equipment and operation, of main noise sources has been made (Table 4). The high result around pillar round (L_{eq} = 118 dBA) was eliminated for two reasons: only one sample was taken and all other samples around drillers had lower results. The jackleg makes the most noise.

Table 4 - Main causes of noise in Quirke No. 2 Mine, grouped according to equipment and operation

No.	Equipment	No. Samples	L_{eq} (dBA)		No.	Occupation	No. Samples	Operation	L_{eq} (dBA)	
			Mean	Std Dev					Mean	Std Dev
1	2-Boom Electric Jumbo	6	100.25	2.48	1	Jumbo Operator	4	Incline/Decline	99.43	2.22
2	3-Boom Electric Jumbo	4	99.5	3.42			5	Trackless Drift	100.70	3.38
3	ST-8 Scooptram	9	100.39	1.94	2	L.H.D. Operator	5	Incline/Decline	99.8	0.88
							4	Trackless Stope	101.13	2.77
4	Rockbolter	8	100.35	8.47	3	Rockbolter	5	Incline/Decline	102.90	8.24
							3	Trackless Stope	96.10	8.47
5	Jackleg-1	13	105.64	8.98	4	Driller	10	Raise	105.91	7.96
6	Jackleg-2	12	99.44	10.42			7	Drift	103.16	11.19
7	Jackleg-3	4	110.53	8			17	Stope	98.17	9.86
8	Stoper	5	94.38	9.63			1	Pillar Round	118	-
9	Wagon Drill	2	99.4	8.63						

From the constructed bar diagram in Fig. 2, it is evident that, according to contemporary standards for occupational noise exposure (OSHA), 61% of the mining work force is jeopardized by noise, and according to arranged regulations (OSHA pending) that percentage will rise to 78. Further prognosis, based on today's condition of work organization, machines and exploration, indicates that the percentage will rise even higher, to 90, by the year 2000. This is a signal to take seriously the work in keeping down noise pollution, and to:

	Base Level (dBA)	Percent of Total	
		Exposed	Nonexposed
OSHA	90	60.96	39.04
OSHA+	85	78.08	21.29
Outlook 2000	80	89.73	10.27

Note: + Pending

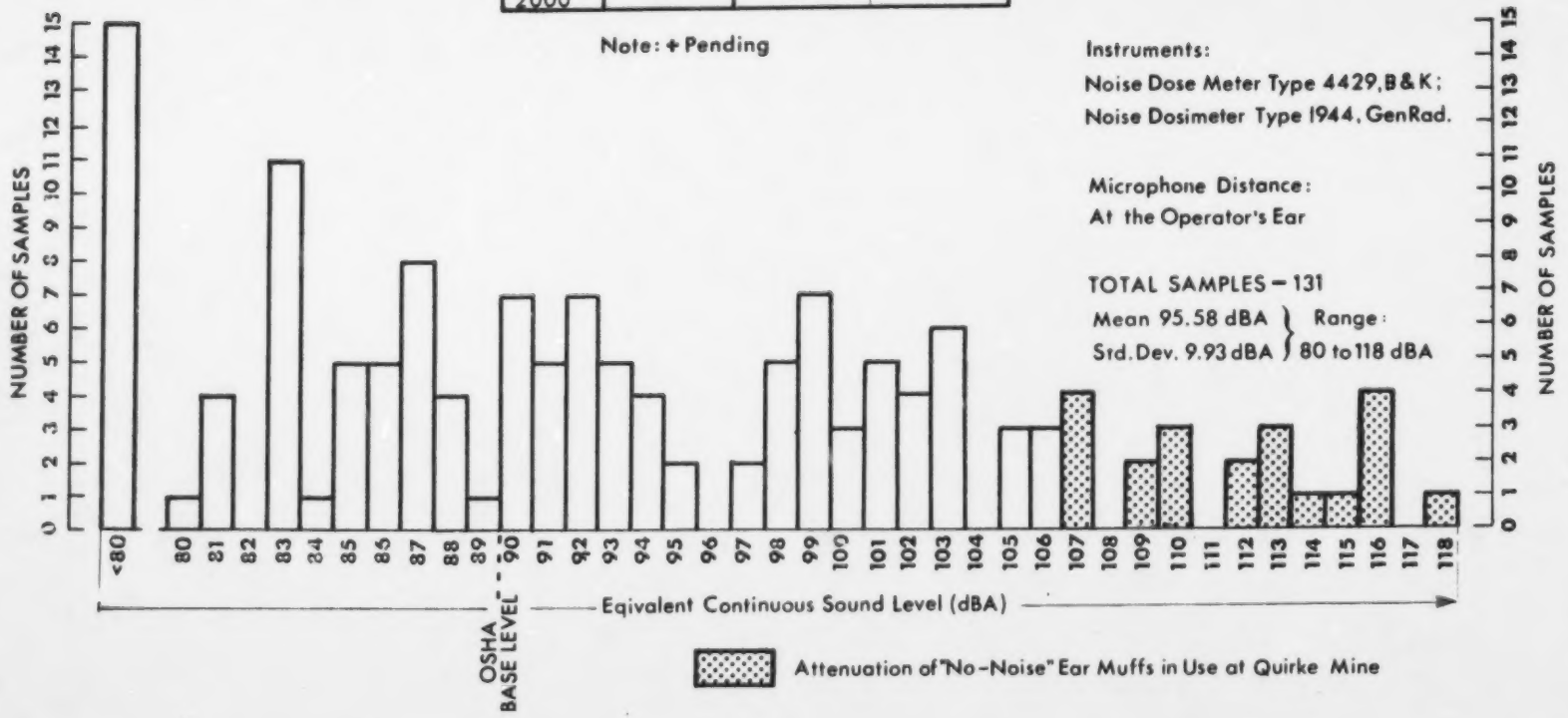

Instruments:
Noise Dose Meter Type 4429, B&K;
Noise Dosimeter Type 1944, GenRad.
Microphone Distance:
At the Operator's Ear
TOTAL SAMPLES – 131
Mean 95.58 dBA
Std. Dev. 9.93 dBA
Range:
80 to 118 dBA
NUMBER OF SAMPLES
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
<80 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118
OSHA BASE LEVEL - 90
Eqivalent Continuous Sound Level (dBA)
Attenuation of "No-Noise" Ear Muffs in Use at Quirke Mine

Fig. 2: Bar diagram of the equivalent continuous sound level (L_{eq}) using OSHA criteria.

1) buy the most silent machines; and

2) increase the efficiency of personal protection.

Earlier enforcement of a noise pollution program will yield higher profit.

4.2. CYCLICAL MEASUREMENT OF NOISE EXPOSURE INDEX (Short measurement)

The total of the day's noise dose can be extrapolated from just a few machine cycles. This permits many operations to be surveyed in a day, and it has the advantage of supervising measurements at all times.

Evaluation of NEI (full-shift) is done very easily:

$$NEI = \frac{\text{Total day units x OSHA percent exposure}}{\text{Unit measured x 100}} \qquad \text{Eq. 1}$$

where: 1) total day units (data obtained from supervision personnel);

2) OSHA percent exposure (surveyor reads it off the instrument); and

3) unit measured (surveyor takes the information during the period of measuring).

Results obtained are noted in a nomogram, from which is obtained the equivalent continuous sound level (L_{eq}) during full shift or 8 hours (1). The accuracy of the method is $\pm$ 0.5 dB, due to paper distortion (Fig. 3). Errors in the graphical method of evaluation are smaller than the accuracy predicted by the standard for Sound Level Meter S1.4(1971) Type S2A. Confidence in the results is high.

Summary test data is seen in Table 5. By this test it was also concluded that the driller is most exposed to noise, followed closely by the rockbolter.

Use of ear protectors is in the same range as in Table 3. Percentage of those who use no protective equipment is greater, around 2.6%. From cycle measurements of the noise exposure index, are calculated values in the

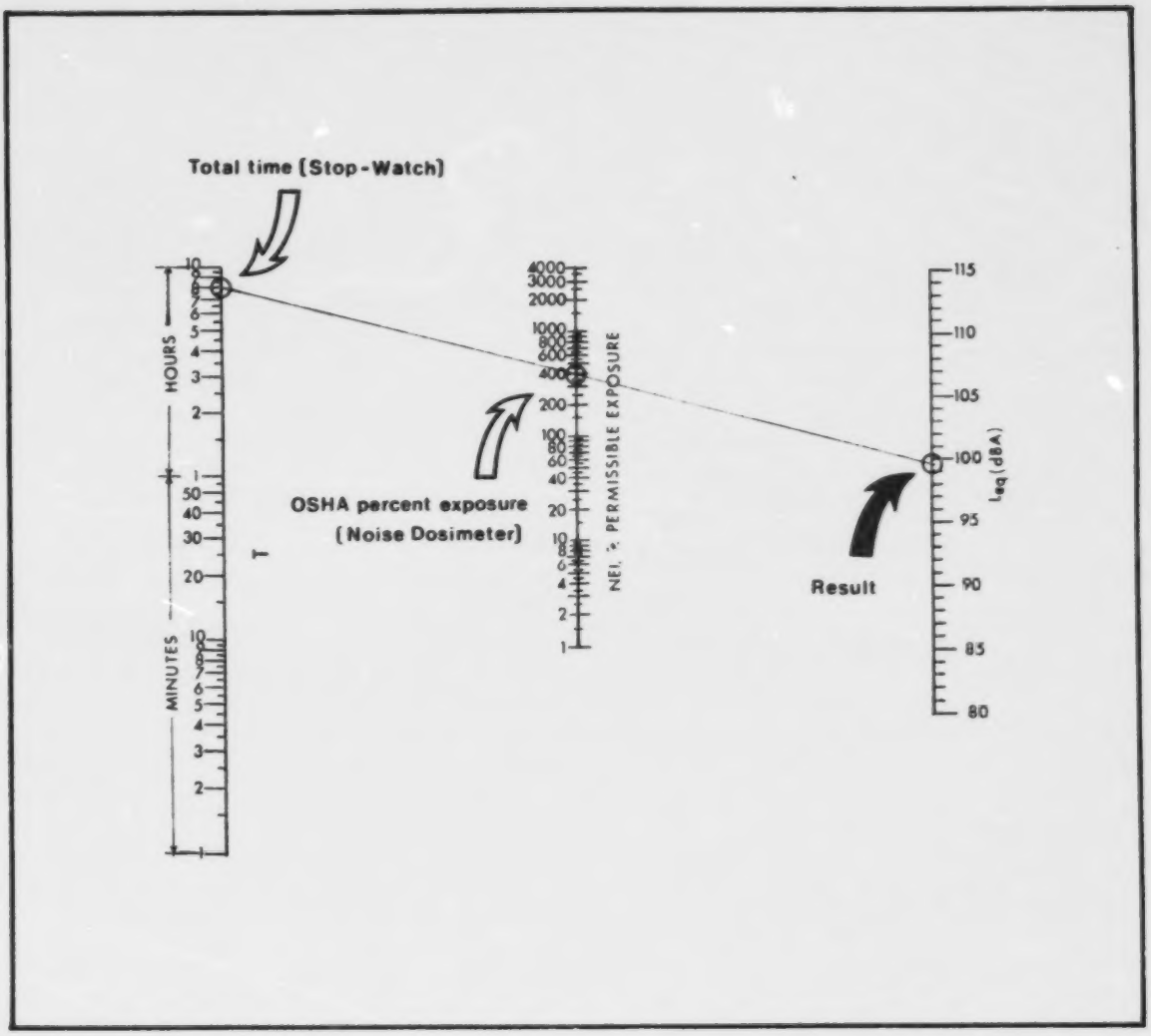


Fig. 3: Method of calculating equivalent continuous sound level.

equivalent continuous sound level (short-time), and they are displayed in a bar diagram (Fig. 4). The average noise level during real work is high, 105 dBA. From total peak measurements, 44% are exposed to sound pressure levels greater than 115 dBA.

A short comparative analysis was carried out between two methods of measuring: full-shift and cycle (short) measurements (Table 6).

Even though the number of measurements is small, the values are nearly

Table 5 - Summary of cyclical measurements of the equivalent sound level and ear protection data

No.	Occupation	No. of Samples	L_{eqs} (dBA)			No. of Samples	Peak SPL (dBA)			Percent of Total				
			Range	Mean	St. Dev.		Range	Mean	St. Dev	Plugs	Muffs	Plugs & Muffs	Questionable	None
1	Jumbo Operator	12	89.2 to 111.5	106.16	5.84	10	106 to 116	111.5	4.06	75	25			
2	L.H.D. Operator	11	89.9 to 112	100.81	5.86	4	110 to 114	111.2	2	27.3	54.5		9.1	9.1
3	Rockbolter	5	105.7 to 112.4	109.26	2.59	5	113 to 117	115	1.87	80	20			
4	Driller	68	101 to 122	115.85	3.91	47	117 to 126	121.68	2.75	20.6	69	7.4		2.9
5	Mucking	41	80 to 119.5	97.78	6.56	27	96 to 115	106.4	7.26	34.1	65.9			
6	Haulagemen	16	94.2 to 110.5	101.83	5.2	17	100 to 123	112.47	8.52	89.5				10.5
7	Level Service	3	105.6 to 106	105.87	0.23	3	107 to 110	108	1.73		66.7		33.3	
8	Dia. Driller	7	80 to 104	98.5	8.33	6	105 to 109	107	2.19		85.7		14.3	
9	U/G Crusher	7	97.2 to 104.5	102.33	2.46	7	96 to 109	107.14	4.91	100				
10	Skip Tender	7	87.9 to 93.2	90.57	2.16	7	104 to 115	107	4.07	85.7			14.3	
11	General Travel*	10	80 to 92.6	85.43	5.64	2	98	98					100	
		187	←						→ Σ	38.9	48.4	2.6	7.4	2.6

*Surface

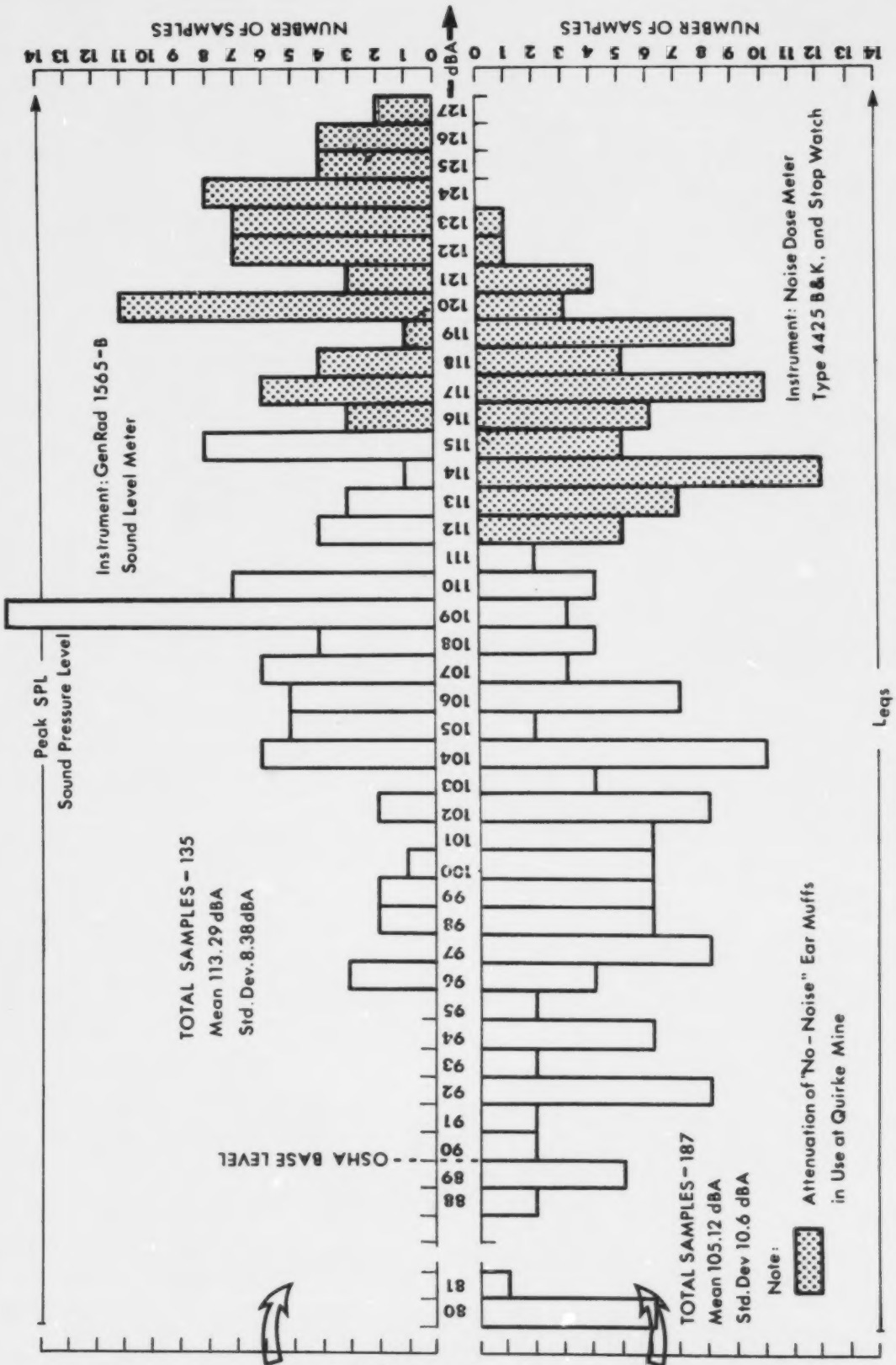


Fig. 4: Bar diagram of the cycle measurements of the equivalent continuous sound level, and the peak sound pressure level.

Table 6 - Comparison between full-shift and cycle measurements of the equivalent continuous sound levels.

Operation	Measurement	No. Samples	L_{eq} (dBA)	
			Act. Mean	Std. Dev.
Jumbo operator	Cycle (short)	5	99.26	2.52
	Shift	9	100.5	2.42
Rockbolter	Cycle (short)	3	98.47	0.76
	Shift	8	100.35	8.47
Driller	Cycle (short)	39	106.46	5.98
	Shift	18	107.56	7.85

equal (Table 6). Cycle measurements show a value somewhat smaller by 1.24 dBA, and 1.1 dBA.

The average continuous equivalent noise level (L_{eq})value, obtained on the basis of cycle (short) measurements, was:

No. measurement	L_{eq} Mean	Std. Dev.
72	99.77	10.35

That value is higher by 4.79 dBA than the one obtained during full shift noise dose measurements (Fig. 2). The reason for such a large difference is the small number of measurements carried out at occupation places with a lower noise level.

4.3. INFLUENCE OF FAN NOISE IN RAISING THE EXPOSURE INDEX

In Table 6, through comparable analyses of short (cycle) and full shift measurements of the noise exposure index, we see that the value of L_{eq} is slightly lower with short measurements. This is because in arriving and leaving work, a worker passes by machines producing noise. In Elliot Lake's uranium mines - apart from noise - silicon dust, gases and radiation are

important environmental factors to consider. Because of this, ventilation systems were developed and thus became one of the elements producing noise in the miners' work place, including areas of work-arrival and -departure used by them.

Ninety-five routine measurements in various places of the mine were carried out (Appendix 3). Summary of measurement results are shown in Table 7. Woods fans showed the best results because differences in Leqs and SPL were smallest, and this proves that the fan worked steady. The summary result showed a difference of 1.3 dBA. This also proves that maintenance is good. The bar diagram constructed is relatively symmetric (Fig. 5).

Larger distortions occur above 106 dBA. These distortions are produced by Joy Fans and non-defined auxiliary fans. From this it is evident that Table 7 does not exclude the bar diagram in Fig. 5, and that, in fact, they complement each other.

A noise survey of 6-fans (24" Woods) was conducted to observe differences (Table 8). One of these fans in 714 drift was equipped with a silencer and an 8-foot section of spiral tubing on the intake end of the silencer (Table 8-1). Two fans in 7141 and 614 drifts were equipped with only a silencer (Table 8-2 and 3). A fourth fan in 6141 drift had only a 10-foot section of spiral tubing on its intake end (Table 8-4). The last two fans in 1165 X-CUT consisted solely of the fan (Table 8-5).

The results show that the addition of a silencer to an underground fan can result in an average attenuation of approximately 13 dBA or ~80%. The study also indicated that a section of intake tubing, used jointly with a silencer, could provide an additional attenuation of 5 dBA or ~42%. This example shows that using low-cost tubing can improve the efficiency of fan silencers, and that it can improve noise exposure of bystanders and passing miners.

Table 7 - Summary of short time measurements of the equivalent sound level and peak sound pressure level of different fans.

No.	Operation	Woods Fan			Joy Fan			Auxiliary Fan			Not Defined			Total		
		No. of Samples	L_{eqs} (dBA)		No. of Samples	L_{eqs} (dBA)		No. of Samples	L_{eqs} (dBA)		No. of Samples	L_{eqs} (dBA)		No. of Samples	L_{eqs} (dBA)	
			Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.
1	Raise	9	105.44	5.07	-	-	-	3	102.47	1.70	-	-	-	12	[illegible]	[illegible]
2	Drift	25	99.76	7.13	-	-	-	10	103.14	3.49	-	-	-	35	100.74	[illegible]
3	Stope	3	106	1.65	-	-	-	-	-	-	-	-	-	3	106	1.65
4	Incline/Decline	17	108.34	4.59	5	103.44	0.55	8	105.38	0.9	3	114.66	0.29	33	107.47	[illegible]
5	Trackless Drift	8	106.26	2.92	2	109.60	0.28	-	-	-	2	99.75	[illegible]	12	105.37	2.61
Σ	Total	62	104.09	6.61	7	104.91	2.56	21	103.92	2.74	5	[illegible]	6.55	95	104.23	[illegible]

No.	Operation	Woods Fan			Joy Fan			Auxiliary Fan			Not defined			Total		
		No. of Samples	Peak - SPL (dBA)		No. of Samples	Peak - SPL (dBA)		No. of Samples	Peak - SPL (dBA)		No. of Samples	Peak - SPL (dBA)		No. of Samples	Peak - SPL (dBA)	
			Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.
1	Raise	8	106.63	5.29	-	-	-	3	105.33	4.04	-	-	-	11	106.27	4.92
2	Drift	24	101.17	7.28	-	-	-	6	105.17	4.26	-	-	-	30	102.17	[illegible]
3	Stope	2	107	-	-	-	-	-	-	-	-	-	-	2	107	-
4	Incline/Decline	17	108.76	4.92	4	105.75	0.50	9	105.63	1.41	3	118	-	32	[illegible]	[illegible]
5	Trackless Drift	4	105	-	2	110	-	-	-	-	1	105	-	7	106.43	2.44
Σ	Total	55	104.8	6.7	6	117.17	2.23	17	105.76	2.95	4	114.75	6.5	82	105.66	6.18

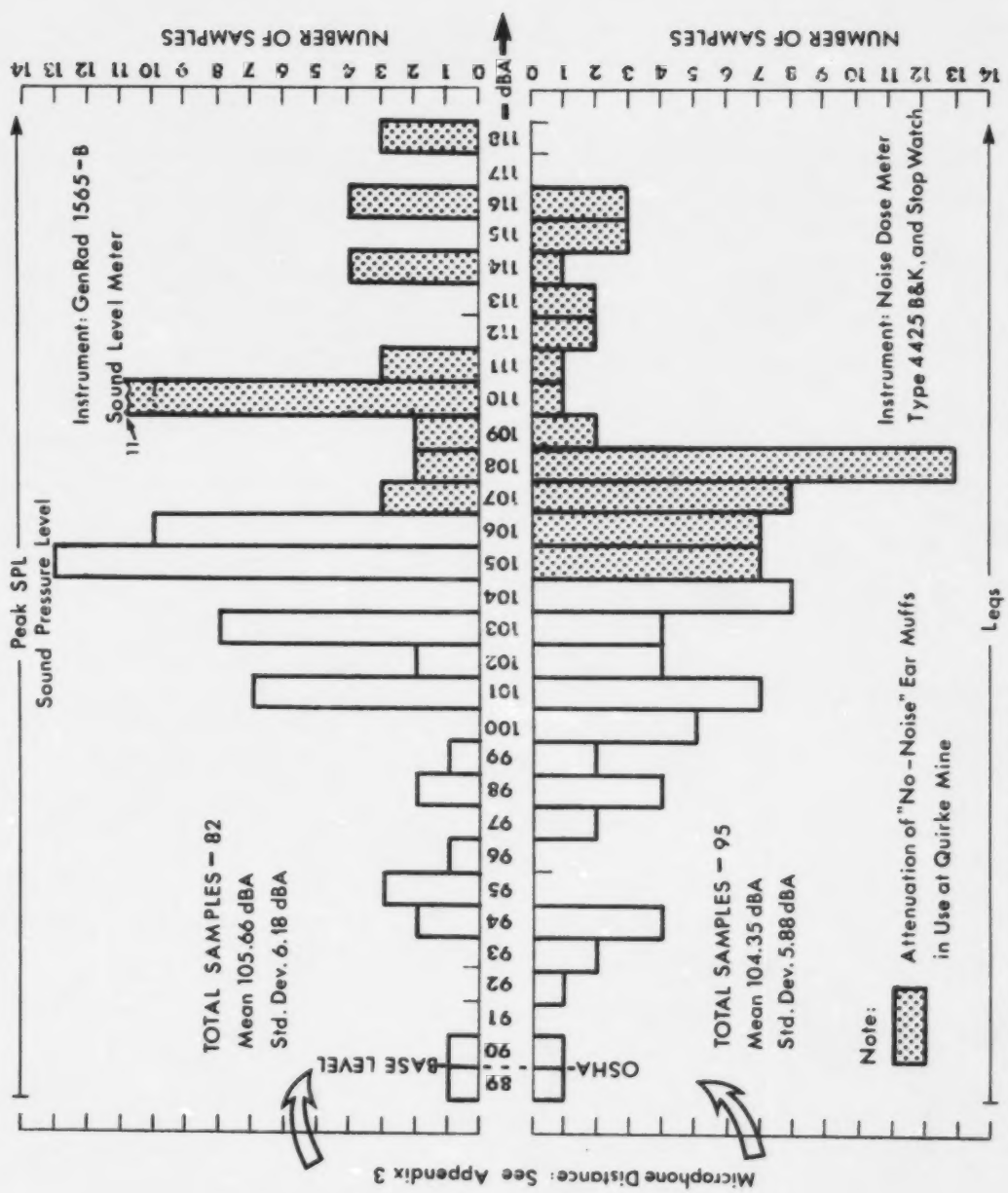
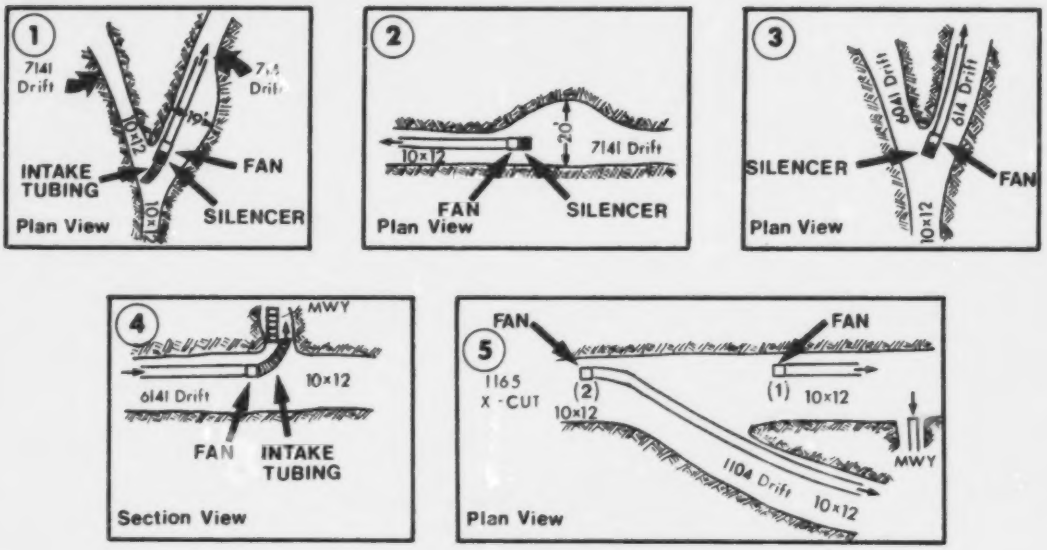

NUMBER OF SAMPLES
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
dBA
89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118
Peak SPL
Sound Pressure Level
Instrument: GenRad 1565-B
Sound Level Meter
TOTAL SAMPLES - 82
Mean 105.66 dBA
Std. Dev. 6.18 dBA
BASE LEVEL
OSHA
TOTAL SAMPLES - 95
Mean 104.35 dBA
Std. Dev. 5.88 dBA
Instrument: Noise Dose Meter
Type 4425 B&K, and Stop Watch
Note:
Attenuation of "No-Noise" Ear Muffs
in Use at Quirke Mine
Leqs
Equivalent Continuous Sound Level (Short Time)
Microphone Distance: See Appendix 3

Fig. 5: Bar diagram of the short time equivalent continuous sound level (Leqs) and peak sound pressure level (SPL) of noise from fans.

Table 8 - Measurements of noise from fans (24" Woods)



By: J. Vincent

No.	Location	Sound Pressure Levels (dBA) (distance from fan 1m)				Remarks
		Grazing Incidence	Perpendicular Incidence		At Side	
		In Front	In Front	In Front-Peak		
1	Fan (24" Woods) 714 Drift	91	93.5	94	88.8	Silencer and intake tubing*
2	Fan (24" Woods) 7141 Drift	96.5	97.3	98	93.8	Silencer
3	Fan (24" Woods) 614 Drift	98.5	100	101	94	Silencer
4	Fan (24" Woods) 6141 Drift	106.2	106.2	108	99.5	Intake tubing+
5	1160 X-CUT (1) Fan (24" Woods)	109	109.5	111	106.5	
	1160 X-CUT (2) Fan (24" Woods)	112	112.9	114	107	

Note: * 8 ft section of spiral tubing.
+ 10 ft section of spiral tubing.

5. NOISE SURVEY OF CRUSHING AND GRINDING OPERATIONS AT PANEL MILL

An informative study of noise was performed at Panel Mill. The cycle (short) equivalent noise level (L_{eqs}) and peak sound pressure level (SPL) were performed (Table 9). The crushing and grinding mill is in a pre-production state. Gravel pebbles were used as the crushing media, instead of the large sized quartz conglomerate underground.

Table 9 - Noise levels in crushing and grinding plants at Panel Mine

Crushing

No.	Location	No. Samples	L_{eqs} (dBA)		No. Samples	Peak SPL (dBA)	
			Mean	Std Dev		Mean	Std Dev
1	Screen only	2	98.6	0.28	2	101	1.41
2	Screen only	1	100		1	107	
3	Crushing pebbles	5	102.45	0.71	5	106.2	2.05
4	Sound Proof Booth	2	76.75	0.35	2	78	
5	Crushing pebbles	4	101.88	0.82	4	105.75	0.96
6	Crushing pebbles	9	104.46	1.12	9	108	1.58
7	Slow pebble flow & crushing pebbles	11	104.46	2.96	11	109	4.43

Grinding
(only 2 mills running)

No.	Location	No. Samples	L_{eqs} (dBA)		No. Samples	Peak SPL (dBA)	
			Mean	Std Dev		Mean	Std Dev
1	Grinding mill	11	93.75	2.13	11	96.27	2.80

It is expected that the noise level will be higher in normal production. Only one grinding circuit was in operation during noise measurement time. During full production, the noise will increase, but not more than 3 to 3.5 dBA or 40% to 50%.

Workers in the crushing plant must wear ear plugs and ear muffs,

though workers in the grinding plant can wear one protective device: ear plugs or ear muffs.

6. ATTENUATION CHARACTERISTICS OF EAR MUFFS AT QUIRKE, No. 2 MINE

A study was undertaken to measure ear muff attenuation in mines. A series of fourteen ear muffs were tested under uniform conditions in the mine. "NO-NOISE" ear muffs are in common use in mines. M.S.A. Mark IV and Amer. Optical were experimentally comparable models.

The only certain means for evaluating the efficiency of the hearing protection program, equipment, training and supervision, is to measure periodically the hearing threshold of all miners exposed to noise (2). This method does not detect problems until some hearing loss has occurred. Because of this, a new method, the "Noise Dosimeter Vest", was developed in the Elliot Lake Laboratory to provide an assessment of attenuation efficiencies of ear muffs in mines (3). Test data on ear muffs are given in Table 10. Brand new ear muffs were those labelled No. 1, No. 2, No. 4, No. 6 and No. 11. Ear muffs No. 1 M.S.A. Mark IV and No. 2 "NO NOISE" were worn by Jumbo Operators. It is requested of operators to move their necks as little as possible. Attenuation in both cases was excellent. In other cases, during normal work, the attenuation varied considerably. Average attenuation for seven "NO NOISE" ear muffs was approximately 12 dBA. The other new ear muffs, No. 4, No. 6, and No. 11, also had similar low attenuation, ranging from 15 to 16 dBA.

7. CONCLUSIONS AND RECOMMENDATIONS

Measurement results show that the majority of workers, 61%, are exposed to noise which varies from 90 dBA to 118 dBA. The measurements also showed that hearing protectors presently used in mines are inadequate when

Table 10 - Attenuation of ear muffs at the Quirke, No. 2 Mine

No.	Occupation	Ear muff	Band	D (cm)	Equivalent Continuous Sound Level - L_{eqa} (dBA)						Average Attenuation (dBA)	Remarks	Location
					Left Muff			Right Muff					
					Over	Under	Diff.	Over	Under	Diff.			
1	3-Boom Jumbo	M.S.A. Mark IV		13.3	107.8	<80	>27.8	108.1	<80	>28.1	>27.95		6230 Decl.
2	2-Boom Jumbo	No-Noise		14	107.2	<80	>27.2	106.6	<80	>26.6	>26.9	Environmental Sampler	8260 Decl.
3	2-Boom Jumbo	No-Noise		14				106.8	93.7	13.1	13.1		8260 Decl.
4	2-Boom Jumbo	M.S.A. Mark IV		14				105	90	15	15		8260 Decl.
5	Rock Bolter (Helper)	No-Noise		13.6	114.6	106.2	8.4	115.2	104.9	10.3	9.35		6235 Stope
6	Jackleg (Driller)	Amer. Optical		14.1	116	102.7	13.3	115.5	99.4	16.1	14.7		982 Stope
7	Jackleg (Driller)	No-Noise		14.7	114.6	98.2	16.4	114.9	105	9.9	13.15	Long hair	950 Raise
8	Jackleg (Driller)	No-Noise		14	111.8	93.2	18.6	112.7	94.6	18.1	18.35	Ideal Condition	1058 Bench
9	Jackleg (Helper)	No-Noise		13.8	112.6	108	4.6	114.3	98.8	15.5	10.05	Long hair	950 Raise
10	Slusherman	No-Noise		13.7	93.6	80.4	12.2	94.4	86.1	8.3	10.45	Lack spring pressure	1056 Stope
11	Slusherman	Amer. Optical		13.9	95.1	<80	>15.1	95.3	85	15.3	>15.2	New muff	1056 Stope
12	Slusherman	No-Noise		14	96.8	<80	>16.8	97.5	<80	>17.5	>17.15		1060 Stope
13	JC800 Scooptram	No-Noise		14.2	102	89.5	12.5	101	91.4	9.6	11.05	New Liner	6235 Stope
14	ST8 Scooptram	No-Noise		13.3	101.7	91.6	10.1	101.5	89.8	11.7	10.9		8255 Decl.
	Mean			13.9			11.83*			11.91*	11.9*	*"No-Noise" Nos. 5,7,8,9,10, 13 and 14 Ear Muffs.	
	Std. Dev.			0.36			4.73			3.56	3.08		

combatting noise existing there.

NEI measurements were done during full shifts and short cycles. The full shift NEI measurements have yet to serve in a suitable and required application. The cause is three-fold:

1) impractical nature of wearing dosimeters;
2) damage to the microphones was frequent, and in some cases, workers lost the dosimeters altogether (damages during our measurements totalled approximately $1,800; and
3) instrument prices are forbidding, so much so, that management has balked at making permanent measurements, as regulations require.

Because of this, cyclical measurements are better and simpler. In this case many work stations are surveyed in a day and there is the advantage of promptly supervised measurements with results immediately evaluated. The results are immediately reported to the worker, either verbally or in writing. This hopefully influences the worker to consider protecting himself starting right away.

Through this method, the worker is also befriended by management and he is given the capability to discuss the environmental problem with colleagues and his union. The principle of full information for workers has already materialized; during measurements, noise records are included with the paychecks (Fig. 6). The bonus report (mine unit activity report) contains information regarding work cycles or units of production. Noise data per cycle of production are adapted to the mine unit activity report. In the time office, data from foremen and environmental engineers are sorted and handed to the computer centre. The computer prints out 5 samples of payment books with noise records that go:

1) to the pay office;

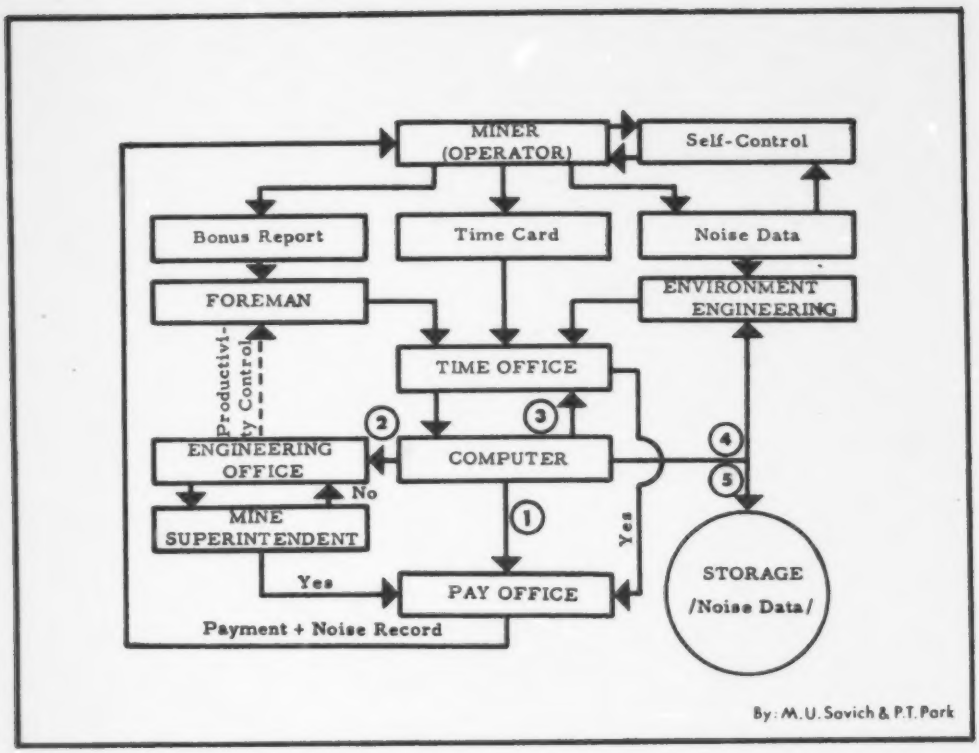


Fig. 6: Cross-payment flow diagram; improving noise environmental control.

2) to the engineering office (final control);

3) to the time office (final control);

4) to environmental engineering; and

5) to storage.

The flow diagram is constructed for Quirke No. 2 Mine, and should be finalized through modification and adaptation by the management of Rio Algom. Thus, the following is recommended:

1) full shift noise dose measurements should be done only in places of no cyclical work, mainly work places where there is less noise;

2) apply short cyclical measurements in other places and immediately evaluate results using the graphical method;

3) for evaluating the efficiency of ear muffs, "Noise Monitor Vests", with

two dosimeters should be used. Clamping force measurements should become mandatory. On the basis of distances between ears (bizygomatic diameter), work out a scale of minimum and maximum values for clamping force, without compromising comfort;

4) carry out a spectral analysis of all machines in the mine and all work places. Compare measurement results with audiometric tests and characteristics of ear protection equipment. This study will show at what frequencies and why miners lose their hearing;
5) because of maintenance, each machine introduced to the mine should be measured for L_{eqs} and SPL peaks.
6) at any work place where the L_{eqs}, and not the L_{eq}, exceeds 102 dBA according to today's use of ear muffs), it should become mandatory for workers to wear both ear muffs and ear plugs.

These methods are simple, they do not require an increase in manpower, and they can be used constructively for noise abatement in mines. The method is so simplified that the surveyor could conceivably learn the noise measurements and evaluations in a few hours.

Tests demonstrated that only mine employees can perform these measurements efficiently.

The Quirke No. 2 Mine falls in with the better organized mines, having high discipline. This does not mean that the recommended measurements be deferred there, because work must respect the worker's health and safety.

The management will have great use for this, since they will be able to follow up on maintenance, work efficiency and protection. Also, the closer union between workers and management has important and beneficial economic and social repercussions.

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9. REFERENCES

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No.	Occupation	Protection		O.S.H.A. Noise Exposure %			Exceeded 115 JBA	Sampling Time (h)	Leq	Equipment	Operation
		Plugs	Muffs	Breast Pocket	Over Muff	Under Muff					
1	Jumbo Operator		○	289			Yes	8.0	97.2	2-Boom Electric Jumbo	Incline/Decline
2	Jumbo Operator		○	359			Yes	8.0	99	2-Boom Electric Jumbo	Incline/Decline
3	Jumbo Operator	●		359			None	8.0	99	3-Boom Electric Jumbo	Incline/Decline
4	Jumbo Operator	●			569		Yes	7.8	102.5	2-Boom Electric Jumbo	Incline/Decline
5	Jumbo Operator		○			200	Yes	7.8	95	3-Boom Electric Jumbo	Trackless Stope
6	Jumbo Operator		○	459			Yes	8.0	101	3-Boom Electric Jumbo	Trackless Drift
7	Jumbo Operator		○	629			None	8.0	103	3-Boom Electric Jumbo	Trackless Drift
8	Jumbo Operator		○	439			None	7.3	101	2-Boom Electric Jumbo	Trackless Drift
9	Jumbo Operator		○	650			Yes	8.0	103.5	2-Boom Electric Jumbo	Trackless Drift
10	Jumbo Operator	●		319			Yes	8.0	98.3	2-Boom Electric Jumbo	-
11	L.H.D. Operator		○	459			Yes	8.0	101	ST-8 Scooptram	Incline/Decline
12	L.H.D. Operator		○	339			Yes	8.0	98.7	ST-8 Scooptram	Incline/Decline
13	L.H.D. Operator		○	429			Yes	8.0	100.3	ST-8 Scooptram	Incline/Decline
14	L.H.D. Operator	●		389			Yes	8.0	99.4	ST-8 Scooptram	Incline/Decline
15	L.H.D. Operator	●		400			None	8.0	99.6	ST-8 Scooptram	Incline/Decline
16	L.H.D. Operator		○	529			Yes	8.0	103	ST-8 Scooptram	Trackless Stope
17	L.H.D. Operator		○	569			Yes	8.0	102.3	ST-8 Scooptram	Trackless Stope
18	L.H.D. Operator	●		550			Yes	7.3	102.2	JC800 Scooptram	Trackless Stope
19	L.H.D. Operator	●			259		Yes	7.8	97	ST-8 Scooptram	Trackless Stope
20	Rockbolter		○	450			Yes	8.0	100.6	Rockbolter	Incline/Decline
21	Rockbolter		○	189			Yes	8.0	94.2	Rockbolter	Incline/Decline
22	Rockbolter	None	None	600			Yes	8.0	102.7	Rockbolter	Incline/Decline
23	Rockbolter	●		439			Yes	8.0	100.5	Rockbolter	Incline/Decline
24	Rockbolter	●			1000		Yes	7.8	116.5	Rockbolter	Incline/Decline
25	Rockbolter/Helper		○	369			Yes	8.0	99.3	Rockbolter	Trackless Stope
26	Rockbolter	●			539		Yes	7.3	102.5	Rockbolter	Trackless Stope
27	Rockbolter	●			59		None	7.3	86.5	Rockbolter	Trackless Stope
28	Other	●			1000		Yes	7.8	116.5	Scissor Lift	Incline/Decline
29	Other	●			119		None	8.0	91	Anfo Loader	Trackless Stope
30	Other		○	879			Yes	8.0	105.3	Scissor Lift	Trackless Drift
31	Other		○	59			None	8.0	85.7	Anfo Loader	Trackless Drift
32	Other	●			69		Yes	8.0	86.8	Anfo Loader	Trackless Drift
33	Driller	●	○	2309			Yes	8.0	112.7	Jackleg-1	Raise
34	Driller		○	1400			Yes	8.0	109	Jackleg-1	Raise
35	Driller		○	1379			Yes	8.0	108.8	Jackleg-1	Raise

Cont. overleaf

Results of Work Day Noise Exposure (cont)

No.	Occupation	Protection		O.S.H.A. Noise Exposure %			Exceeded 115 dBA	Sampling Time (h)	Leq	Equipment	Operation
		Plugs	Muffs	Breast Pocket	Over Muff	Under Muff					
36	Driller		○			889	Yes	8.0	105.6	Jackleg-1	Raise
37	Driller		○			1000	Yes	8.3	106	Jackleg-1	Raise
38	Driller	●		2900			Yes	8.0	114.2		Bench
39	Driller	●	○	3489			Yes	8.0	115.5	Jackleg-3	Drift
40	Driller	●	○			339	Yes	7.8	98.8	Jackleg-3	Drift
41	Driller		○	2059			Yes	8.0	112	Jackleg-3	Drift
42	Driller		○	9			Yes	8.0	<80	Stoper	Drift
43	Driller		○	329			Yes	8.0	98.5	Jackleg-2	Drift
44	Driller		○	79			Yes	8.0	88.2	Jackleg-2	Drift
45	Driller	●		3439			Yes	8.0	115.8	Jackleg-3	Drift
46	Driller	●			79		Yes	4.0	93.3	Jackleg-2	Drift
47	Driller		○	1139			Yes	8.0	107.1	Jackleg-1	Stope
48	Driller		○	39			Yes	8.0	83.2	Jackleg-1	Stope
49	Driller		○	629			Yes	8.0	103	Stoper	Stope
50	Driller		○	800			Yes	8.0	105	Jackleg-1	Stope
51	Driller		○	1509			Yes	8.0	109.7	Jackleg-2	Stope
52	Driller		○			949	Yes	8.0	106	Stoper	Stope
53	Driller		○			129	Yes	7.8	91.7	Stoper	Stope
54	Driller		○			19	Yes	7.6	<80	Jackleg-2	Stope
55	Driller		○			139	Yes	7.6	92	Jackleg-2	Stope
56	Driller		○			119	Yes	7.5	91.7	Jackleg-2	Stope
57	Driller		○			50	None	7.5	85.2	Jackleg-2	Stope
58	Driller		○			50	Yes	7.5	85.2	Stoper	Stope
59	Driller		○			100	Yes	7.6	93	Jackleg-2	Stope
60	Driller	●		889			Yes	8.0	105.5	Wagon drill	Stope
61	Driller	●			1100		Yes	7.6	107.3	Jackleg-2	Stope
62	Driller		○	4209			Yes	7.6	118	Jackleg-2	Pillar Round
63	Driller		○	59			Yes	7.8	86	Stoper	Trackless Stope
64	Driller		○	2219			Yes	8.0	112.2	Jackleg-1	
65	Driller(Helper)		○			159	Yes	8.0	93.3	Wagon drill	Raise
66	Driller(Helper)		○			2500	Yes	8.0	113.3	Jackleg-1	Raise
67	Driller(Helper)		○			2500	Yes	8.0	113.3	Jackleg-1	Raise
68	Driller(Helper)		○			1000	Yes	8.0	106.6	Jackleg-1	Raise
69	Driller(Helper)	●			109		Yes	8.0	90.5	Jackleg-1	Raise
70	Driller(Helper)	●		1479			Yes	8.0	109.7	Jackleg-2	Stope

Cont. overleaf

No.	Occupation	Protection		O.S.H.A. Noise Exposure %			Exceeded 115 dBA	Sampling Time (h)	Leq	Equipment	Operation
		Plugs	Muffs	Breast Pocket	Over Muff	Under Muff					
71	Driller(Helper)		O	1029			Yes	8.0	106.7	Jackleg-2	Stope
72	Slusherman		O	29			None	8.0	81	Rand Slusher (3 lever)	Stope
73	Slusherman		O	39			Yes	8.0	83		Stope
74	Slusherman		O	39			Yes	8.0	83	Rand Slusher (3 lever)	Stope
75	Slusherman		O	19			Yes	8.0	<80	Rand Slusher (3 lever)	Stope
76	Slusherman		O			0	None	8.0	0	Rand Slusher (3 lever)	Stope
77	Slusherman		O			79	Yes	7.6	87.2		Stope
78	Slusherman		O			9	None	7.6	<80	Rand Slusher (3 lever)	Stope
79	Slusherman	●		159			Yes	8.0	93.6	Rand Slusher (3 lever)	Stope
80	Slusherman	●			59		Yes	7.6	86	Joy Slusher (2 lever)	Stope
81	Slusherman	●			9		Yes	8.0	<80	Joy Slusher (2 lever)	Stope
82	Slusherman	●			50		Yes	7.6	85	Joy Slusher (2 lever)	Stope
83	Slusherman	?	?	169			Yes	8.0	94	Rand Slusher (3 lever)	Stope
84	Haulageman		O			59	Yes	8.0	86	Electric Motor	Chute Puller
85	Haulageman	●		109			Yes	8.0	90.7		Chute Puller
86	Haulageman	●		9			Yes	8.0	<80		Chute Puller
87	Haulageman	●			319		Yes	7.6	98.7	Electric Motor	Chute Puller
88	Haulageman	●			79		Yes	7.6	88.5	Electric Motor	Chute Puller
89	Haulageman	●			129		Yes	7.8	92	Electric Motor	Chute Puller
90	Haulageman	●			219		Yes	8.0	95.5		Chute Puller
91	Haulageman	●		79			Yes	8.0	88	Electric Motor	Motorman
92	Haulageman	●			39		Yes	7.8	83	Electric Motor	Motorman
93	Trackman		O			69	Yes	8.0	87.1		Drift
94	Trackman	●			129		Yes	7.8	91.8		Drift
95	Trackman	?	?	0			None	8.0	0		Drift
96	Trackman	?	?	29			Yes	8.0	81		Drift
97	Mechanics	●		29			Yes	8.0	80.3		Trackless Drift
98	Mechanics	●		29			None	4.0	85.6		-
99	Mechanics	?	?	9			None	7.5	<80		-
100	Mechanics	?	?		19		None	7.8	<80		Drift
101	Mechanics	●			119		Yes	7.8	91.6		Trackless Drift
102	Mechanics	?	?		1000		Yes	7.8	116.5		Trackless Drift
103	Mechanics	●			100		Yes	7.5	90.3		
104	Mechanics	●			100		Yes	7.5	90.3		
105	Mechanics	●			139		Yes	7.8	92		

Cont. overleaf

Results of Work Day Noise Exposure (Cont)

No.	Occupation	Protection		O.S.H.A. Noise Exposure I			Exceeded 115 JBA	Sampling Time (h)	Leq	Equipment	Operation
		Plugs	Muffs	Breast Pocket	Over Muff	Under Muff					
106	Electricians		O			119	Yes	8.0	91		Trackless Drift
107	Electricians		O			29	None	7.5	80.7		Drift
108	Electricians		O			9	Yes	7.5	<80		Drift
109	Pipe Fitter	●		ø			None	8.0	ø		Drift
110	Pipe Fitter	?	?	19			Yes	7.7	<80		Drift
111	Pipe Fitter	?	?		69		Yes	7.5	87		Drift
112	Pipe Fitter		O	100			None	8.0	90		Trackless Drift
113	Level Service		O	50			Yes	8.0	85		-
114	Level Service	●			50		Yes	7.5	85.1		-
115	Level Service	●			69		Yes	8.0	87		-
116	Level Service	?	?	100			None	8.0	90		Drift
117	Level Service	?	?		19		None	8.0	<80		Drift
118	Level Service	●			19		None	8.0	<80		-
119	Timberman	●		100			Yes	8.0	90		Manway
120	Timberman	?	?		89		Yes	8.0	89		Manway
121	Diamond Driller		O			29	None	6.0	83		Incline/Decline
122	Diamond Driller		O			89	None	6.0	91		Drift
123	Diamond Driller		O		269		None	6.8	98.3		Incline/Decline
124	Diamond Driller		O			29	None	6.0	83		Incline/Decline
125	U/G Crusher	●			250		Yes	5.0	100		
126	Skip Tender	●		50			None	2.5	93		Loading Pocket
127	Skip Tender	●			39		None	2.0	93		Loading Pocket
128	Cage Tender	?	?	50			None	8.0	85		-
129	Shift Boss	●		209			None	4.5	99.7		
130	Shift Boss	●		9			Yes	7.1	<80		-
131	Shift Boss	●			39		Yes	7.2	83.5		-
132	Shift Boss	●			69		Yes	7.3	87.5		-
133	Shift Boss	●			29		None	7.3	81.2		-
134	Shift Boss	●			39		Yes	7.1	83.5		-
135	Shift Boss	●			59		Yes	7.3	86.7		-
136	Shift Boss		O			19	None	7.3	<80		-
137	Shift Boss	?	?		39		Yes	7.2	83.3		-
138	Ventilation Tech.		O	50			None	3.2	91		-
139	Ventilation Tech.		O			19	None	4.0	82.8		-
140	Ventilation Tech.		O			119	Yes	3.3	98		-

Cont. overleaf

Results of Work Day Noise Exposure (Cont)

No.	Occupation	Protection		O.S.H.A. Noise Exposure %			Exceeded 115 dBA	Sampling Time (h)	Leq	Equipment	Operation
		Plugs	Muffs	Breast Pocket	Over Muff	Under Muff					
141	Ventilation Tech.		O			0	None	2.0	0		-
142	Ventilation Tech.		O			9	None	3.3	<80		-
143	Ventilation Tech.	●			619		Yes	3.2	110		-
144	Surveyor		O			29	Yes	4.8	84		Drift
145	Surveyor		O	369			Yes	6.0	101.5		Trackless Stope
146	Surveyor	●	O		19		None	4.0	82.6		Trackless Stope
147	Surveyor		O			39	Yes	4.5	57		-
148	Geologist		O			69	Yes	3.2	93.7		-
149	Geologist		O			39	Yes	2.8	90.5		-
150	Geologist		O			0	None	4.5	●		-
151	Geologist		O			29	Yes	3.2	87		-

Results of Cyclical Measurement of Noise Exposure Index
(short measurement)

No.	Occupation	Protection		O.S.H.A. % Exposure	Sampling Time (min)	L_{eqs} (dBA)	Unit Measured	Total Day Units	O.S.H.A. % Exposure (8 hr)	L_{eq} (dBA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
1	Jumbo Operator	●		17.8	8.33	107	26				106	2-Boom Electric Jumbo	Trackless Drift
2	Jumbo Operator	●		14	6	107.2	13	325	350	99	112	2-Boom Electric Jumbo	Trackless Drift
3	Jumbo Operator	●		42	12	110.5	26	325	525	102	116	2-Boom Electric Jumbo	Trackless Drift
4	Jumbo Operator	●		0.7	4	89.2	5	40	5.6	<80		2-Boom Electric Jumbo	Incline/Decline
5	Jumbo Operator		○	34.0	9.33	110.2	26				115	2-Boom Electric Jumbo	Trackless Drift
6	Jumbo Operator		○	13.6	9	104	10	40	54.4	85.3		2-Boom Electric Jumbo	Incline/Decline
7	Jumbo Operator	●		18	8.75	106.2	26				106	2-Boom Electric Jumbo	Trackless Drift
8	Jumbo Operator	●		36	15.5	107.2	39	325	300	97.8	112	2-Boom Electric Jumbo	Trackless Drift
9	Jumbo Operator	●		17	9.75	105.3	26	325	212.5	96	112	2-Boom Electric Jumbo	Trackless Drift
10	Jumbo Operator	●		16.1	9	105.6	26				106	2-Boom Electric Jumbo	Trackless Drift
11	Jumbo Operator	●		20	5	111.5	1	25	500	101.5	115	2-Boom Electric Jumbo	Trackless Drift
12	Jumbo Operator		○	34.3	10	110	20				115	2-Boom Electric Jumbo	Trackless Drift
13	L.H.D. Operator		○	21	21	101.5	2					ST-8 Scooptram	Incline/Decline
14	L.H.D. Operator	?	?	7.5	7.5	101	1					ST-8 Scooptram	Incline/Decline
15	L.H.D. Operator		○	6	26	89.9	2					ST-8 Scooptram	Incline/Decline
16	L.H.D. Operator	●		24.4	21	102	2					JC800 Scooptram	Trackless Stope
17	L.H.D. Operator	●		24.4	21	102	2					JC800 Scooptram	Trackless Stope
18	L.H.D. Operator	-	-	14.3	9	104.2	1	15	214.5	96.1		JC800 Scooptram	Incline/Decline
19	L.H.D. Operator		○	12	15	99.5	3				110	JC800 Scooptram	Trackless Stope
20	L.H.D. Operator	●		24.4	21	102	2					JC800 Scooptram	Trackless Stope
21	L.H.D. Operator		○	18.9	14.5	102.8	3				110	JC800 Scooptram	Trackless Stope
22	L.H.D. Operator		○	2.9	10	92	2				110	JC800 Scooptram	Trackless Stope
23	Rockbolter		○	26.5	6	112	1				114	Rockbolter	Incline/Decline
24	Rockbolter	●		29	10.5	105.7	2	24	348	99	116	Rockbolter	Incline/Decline
25	Rockbolter	●		21	5	112.4	1				113	Rockbolter	Incline/Decline
26	Rockbolter		○	12.5	4.25	109	1	24	300	97.6	117	Rockbolter	Incline/Decline

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Results of Cyclical Measurement of Noise Exposure Index (short measurement) (cont)

No.	Occupation	Protection		O.S.H.A. % Exposure	Sampling Time (min)	L_{eqs} (dBA)	Unit Measured	Total Day Units	O.S.H.A. % Exposure (8 hr)	L_{eq} (dBA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
27	Rockbolter	●		17	4.25	111	1				113	Rockbolter	Incline/Decline
28	Rockbolter	●		40	14.75	108.2	3	24	320	98.8	116		Incline/Decline
29	Driller	●		314	32	117							Stope
30	Driller		○	244	33.5	115.7	36	216	1344	108.5	122	Jackleg-1	Stope
31	Driller		○	39.6	3	119.5						Jackleg-1	Raise
32	Driller		○	25	2.5	121.5		260			125	Jackleg-1	Raise
33	Driller		○	7.5	0.5	113.7						Jackleg-1	Raise
34	Driller		○	258	23.5	120	40	250	1612.5	110	125	Jackleg-1	Raise
35	Driller		○	195	18.75	117.4	30	260	1690	110.3	125	Jackleg-1	Raise
36	Driller		○	486	32.5	123.2	32	200	3037.5	115.3	126	Jackleg-1	Raise
37	Driller		○	64	4.75	120.8		208			126	Jackleg-1	Raise
38	Driller		○	384	27	121	40	208	1996.8	111.5	126	Jackleg-1	Raise
39	Driller		○	7.5	0.75	112.8						Jackleg-1	Raise
40	Driller	●		65	14	112.2		150			120	Jackleg-1	Bench
41	Driller	●		83	13	114.5		180			120	Jackleg-1	Bench
42	Driller	●		314	32	117	36	174	1517.7	109.7	123	Jackleg-1	Stope
43	Driller	●		140	20.5	113.1	30	150	700	104	120	Jackleg-1	Bench
44	Driller		○	62	10.45	113.2	12	144	125	91.7	124	Jackleg-1	Bench
45	Driller		○	56	9	114.1	12	144	108	90.5	124	Jackleg-1	Bench
46	Driller		○	144	19.45	115.5	24	144	864	105.3	124	Jackleg-1	Bench
47	Driller	●		30	4.33	115	6	192	960	106.4	122	Jackleg-1	Manway/Boxhole/Cut-out
48	Driller	-	-	105	13.75	115.5	24	216	947	106	121	Jackleg-1	Manway-Boxhole/Cut-out
49	Driller	-	-	101	12.5	116	24	216	909	105.8	121	Jackleg-1	Manway-Boxhole/Cut-out
50	Driller	●		212	15.75	119	32	200	1325	108.7	120	Jackleg-1	Pillar Round
51	Driller	●		254	24.5	117.5	36	396	2794	114	124	Jackleg-1	Stope
52	Driller		○	23.9	22	101	36	396	262.9	97	124	Jackleg-1	Stope

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Results of Cyclical Measurement of Noise Exposure Index
(short measurement) (Cont)

No.	Occupation	Protection		O.S.H.A. % Exposure	Sampling Time (min)	Leqs (dBA)	Unit Measured	Total Day Units	O.S.H.A. % Exposure (8 hr)	Leq (dBA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
53	Driller		O	4.6	1	113.7						Jackleg-1	Stope
54	Driller		O	32.5	3	119						Jackleg-1	Stope
55	Driller		O	24	2	119.3						Jackleg-1	Stope
56	Driller		O	351	35	117.4	36	174	1696.5	110.6	123	Jackleg-1	Stope
57	Driller		O	236	29	117	36	288	1888	111.3	118	Jackleg-1	Stope
58	Driller		O	20.3	2	119.1						Jackleg-1	Stope
59	Driller		O	212	36.5	113.7	36	288	1696	110.6	118	Jackleg-1	Stope
60	Driller		O	124	12	117.4	16	208	1612	110	122	Jackleg-1	Stope
61	Driller		O	148	13	119.3	16	208	1924	111.5	122	Jackleg-1	Drift
62	Driller		O	32	2.5	119.9	1	16	512	101.8	123	Jackleg-2	Drift
63	Driller		O	218	14	119.8	18	212	2567.6	113.7	124	Jackleg-2	Drift
64	Driller		O	60	5	118.5		212			124	Jackleg-2	Drift
65	Driller		O	8.2	3.5	108.5						Jackleg-2	Drift
66	Driller		O	6.2	3	106.2						Jackleg-2	Drift
67	Driller		O	7.2	4.5	104.2						Jackleg-2	Drift
68	Driller		O	107	7.25	119.8	18	104	618.2	103.3	124	Jackleg-3	Drift
69	Driller		O	260	16	120.9	24	104	1126.7	107.3	124	Jackleg-3	Drift
70	Driller		O	466	37	118.3	48	104	1009.7	106.7	125	Jackleg-3	Drift
71	Driller	●		502	25.5	122	40	222	2786	114	122	Wagon Drill	Bench
72	Driller	●	O	27	2.5	118		222			122	Wagon Drill	Bench
73	Driller	●	O	257	25.17	118	20	222	2852.7	114.5	122	Wagon Drill	Bench
74	Driller	●		119.3	15.5	116	12	210	2087.7	111.8	118	Wagon Drill	Stope
75	Driller	●		100	15	114.2	12	210	1750	111	118	Wagon Drill	Stope
76	Driller		O	6.8	1	116						Stoper	Stope
77	Driller		O	36.2	4.75	116.9	1					Stoper	Stope
78	Driller	●		19	3.5	114	1	45	855	105.4	120	Stoper	Drift

Cont. overleaf

Results of Cyclical Measurement of Noise Exposure Index (short measurement) (Cont.)

No.	Occupation	Protection		O.S.H.A. % Exposure	Sampling Time (min)	L_{eq} (dBA)	Unit Measured	Total Day Units	O.S.H.A. % Exposure (8 hr)	Leq (dBA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
79	Driller	●	○	28.1	4.25	114.1	1	12	377.2	99.6		Stoper	Drift
80	Driller	●	○	35.8	5.17	115	1	12	429.6	100.5		Stoper	Drift
81	Driller	●	○	32.5	5.67	113.2	1	12	390	99.2		Stoper	Drift
82	Driller		○	51.7	9.17	114.3	8	108	697.9	103.3	117	Stoper	Stope
83	Driller		○	24	3.75	114.1	1	16	384	99.7	123	Stoper	Drift
84	Driller	●		45	9.5	113.1	2	45	1012.5	107	120	Stoper	Drift
85	Driller	●		36	6.5	113.2	2	45	810	105	120	Stoper	Drift
86	Driller		○	38	6.75	114	6	132	836	105.2	119	Stoper	Stope
87	Driller		○	7.7	1	116.5						Stoper	Stope
88	Driller		○	44	10	112.3					117	Stoper	Stope
89	Driller		○	10.5	1.2	117.8						Stoper	Stope
90	Driller		○	45	5.25	116.9					121	Stoper	Stope
91	Driller		○	49.5	6.5	115						Stoper	Stope
92	Driller		○	51.7	9.17	113.9					117	Stoper	Stope
93	Driller		○	32	7.25	112.8					117	Stoper	Stope
94	Driller		○	28	6.75	112.5					117	Stoper	Stope
95	Driller		○	10.4	1	117.5						Jackleg-1	Stope
96	Driller		○	9.2	1	118.6						Jackleg-1	Stope
97	Mucking		○	29	19.75	104	3	16	154.7	92.9			Drift
98	Mucking		○	1.6	3	97.5							Stope
99	Mucking		○	1.2	3	95.3							Stope
100	Mucking		○	1.1	3	94.5							Stope
101	Mucking		○	1.1	3	94.5							Stope
102	Mucking		○	1.4	3	96							Stope
103	Mucking		○	183	21	116					123	Jackleg-3	Drift
104	Mucking		○	47	3.75	119.5					123	Jackleg-3	Drift

Cont. overleaf

Results of Cyclical Measurement of Noise Exposure Index (short measurement) (Cont)

No.	Occupation	Protection		O.S.H.A. % Exposure	Sampling Time (min)	Leqs (dBA)	Unit Measured	Total Day Units	O.S.H.A. % Exposure (8 hr)	Leq (dBA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
105	Mucking	●		1.5	3	97					100	Rand Slusher (3 lever)	Bench
106	Mucking	●		2.8	5	97.2					100	Rand Slusher (3 lever)	Bench
107	Mucking	●		5.7	9.5	97.2					100	Rand Slusher (3 lever)	Bench
108	Mucking	●		7.2	10	99.2					109	Rand Slusher (3 lever)	Stope
109	Mucking	●		2.2	3	99.8					109	Rand Slusher (3 lever)	Stope
110	Mucking	●		2.2	3	98.9					107	Rand Slusher (3 lever)	Stope
111	Mucking	●		3.7	5	99					107	Rand Slusher (3 lever)	Stope
112	Mucking	●		5.9	8	98					107	Rand Slusher (3 lever)	Stope
113	Mucking	●		4.2	10	96					110	Rand Slusher (3 lever)	Stope
114	Mucking	●		1.2	3	94					110	Rand Slusher (3 lever)	Stope
115	Mucking	●		3.7	5	99					109	Rand Slusher (3 lever)	Stope
116	Mucking	●		1.2	2.5	97						Rand Slusher (3 lever)	Stope
117	Mucking		○	2.3	5	96					102	Rand Slusher (3 lever)	Stope
118	Mucking		○	2.5	5	97					102	Rand Slusher (3 lever)	Stope
119	Mucking	●		3.2	5	98.9					99	Rand Slusher (3 lever)	Raise
120	Mucking	●		1.7	3	98					99	Rand Slusher (3 lever)	Raise
121	Mucking	●		1.9	5	94.5					110	Rand Slusher (3 lever)	Stope
122	Mucking		○	3.2	7	96						Rand Slusher (3 lever)	Stope
123	Mucking		○	1.0	30	80						Rand Slusher (3 lever)	Stope
124	Mucking		○	2.0	4.5	95.5						Rand Slusher (3 lever)	Stope
125	Mucking	●		1.0	3.5	92.5					96	Joy Slusher (2 lever)	Stope
126	Mucking	●		1.7	8.5	89.5					96	Joy Slusher (2 lever)	Stope
127	Mucking	●		1.3	5	92					104	Joy Slusher (2 lever)	Stope
128	Mucking	●		4	3.25	102.5					107	Joy Slusher (2 lever)	Stope
129	Mucking	●		1	5	89.9					96	Joy Slusher (2 lever)	Stope
130	Mucking	●		1.6	6	92					104	Joy Slusher (2 lever)	Stope

Cont. overleaf

Results of Cyclical Measurement of Noise Exposure Index
(short measurement) (Cont)

No.	Occupation	Protection		O.S.H.A. % Exposure	Sampling Time (min)	L_{eqs} (dBA)	Unit Measured	Total Day Units	O.S.H.A. % Exposure (8 hr)	L_{eq} (dBA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
131	Mucking	●		1	3.55	91.9					104	Joy Slusher (2 lever)	Stope
132	Mucking		○	54.2	32	104.9	2	16	433.6	100.5		Mucking Machine	Drift
133	Mucking		○	49.6	16	109	2	16	396.8	99.7		Mucking Machine	Drift
134	Mucking	●		9.7	10	101	2	14	67.9	87	115	Diesel Motor	Drift
135	Mucking	●		29.5	35	100	1	14	413	100.3	115	Diesel Motor	Drift
136	Mucking		○	7	8	100	1	16	112	90.8		Diesel Motor	Drift
137	Mucking		○	1.7	3	98.2							
138	Haulage man	●									127		Dumping at Ore Pass
139	Haulage man	●		4	10	94.2	14				105		Dumping at Ore Pass
140	Haulage man	●		1.5	1.74	103.3	8	58	10.9	<80	108		Dumping at Ore Pass
141	Haulage man	●									123		Dumping at Ore Pass
142	Haulage man	●		9.4	3.5	108	1				115		Chute Puller
143	Haulage man	●		20.9	7	109.1	10	70	146.3	92.5	126		Chute Puller
144	Haulage man	●		252	10	108	10	70	1764	111	127		Chute Puller
145	Haulage man	●		3.2	2.75	104	12				106	Electric Motor	Dumping at Ore Pass
146	Haulage man	●		1.8	1.75	104.5	7	83	21.3	<80		Electric Motor	Dumping at Ore Pass
147	Haulage man	●		1.2	1.75	101.6	8				100	Electric Motor	Dumping at Ore Pass
148	Haulage man	●		1	1.25	100.2	7	83	11.9	<80	106	Electric Motor	Dumping at Ore Pass
149	Haulage man	●		3.4	5.75	98	8	83				Electric Motor	Dumping at Ore Pass
150	Haulage man	●		1.6	3	96.9	7				108	Electric Motor	Dumping at Ore Pass
151	Haulage man	●		4.8	7.5	97.8	10	70	33.6	82.5	108	Diesel Motor	Dumping at Ore Pass
152	Haulage man	●		4.4	1.75	110.5	10	70	30.8	81.2	112	Diesel Motor	Dumping at Ore Pass
153	Haulage man	-	-	1.5	3.67	94.5	12	60	7.5	<80	105	Diesel Motor	Dumping at Ore Pass
154	Haulage man	-	-	3	5	97.8	13	118	27.2	80.2	108	Diesel Motor	Dumping at Ore Pass
155	Haulage man	●		2	2.75	100.8	10	70	14	<80	113	Diesel Motor	Dumping at Ore Pass
156	Haulage man	●									115		Dumping at Ore Pass

Cont. overleaf

Results of Cyclical Measurement of Noise Exposure Index (short measurement) (Cont)

No.	Occupation	Protection		O.S.H.A. Exposure	Sampling Time (min)	L_{eqs} (dBA)	Shift Measured	Total Day Units	O.S.H.A. Exposure (8 hr)	Leq (dbA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
117	Level Service		O	2.3	1.25	106	1				107	Tugger	Drift
118	Level Service	?	?	3.4	2	105.6	1				107	Tugger	Incline/Decline
159	Level Service		O	2	1.09	106	1				110	Tugger	Drift
160	Dia. Driller		O	16.3	11.25	104	4	55	224.1	96	109	JC Tractor	Incline/Decline
161	Dia. Driller		O	10	9	102.2	4	55	137.5	92	109	JC Tractor	Incline/Decline
162	Dia. Driller		O	7.4	9.25	99.9	4	55	101.75	90.3	105	JC Tractor	Incline/Decline
163	Dia. Driller ?	?	?	0.1	18	80							Drift
164	Dia. Driller		O	8.5	8.5	100.8	4	55	116.9	91.2	105	JC Tractor	Incline/Decline
165	Dia. Driller		O	15.8	12	103.8	4	55	217.3	95.7	109	JC Tractor	Incline/Decline
166	Dia. Driller		O	6.6	9	98.8	4	55	90.8	89.4	105	JC Tractor	Incline/Decline
157	U/G Crusher	●		3.5	3	102.9					109		Crusher
158	U/G Crusher	●		9	5.75	104.4					109		Crusher
169	U/G Crusher	●		4.3	3	104.5					109		Crusher
170	U/G Crusher	●		8.3	6.5	103					109		Crusher
171	U/G Crusher	●		11	10	102.5					109		Crusher
172	U/G Crusher	●		0.5	1.16	97.2					96		Crusher
173	U/G Crusher	●		4.9	5	101.8					109		Crusher
174	Skip Tender	?	?	2	6.5	92.5	2				115		Loading Pocket
175	Skip Tender	●		1.1	6.5	88	2				104		Loading Pocket
176	Skip Tender	●		1.9	9.25	89.4	3				104		Loading Pocket
177	Skip Tender	●		2.2	13	87.9	4				104		Loading Pocket
178	Skip Tender	●		3.2	12.5	91	4				109		Loading Pocket
179	Skip Tender	●		1.6	5.75	92	2				109		Loading Pocket
180	Skip Tender	●		1.8	5.50	93.2	2				109		Loading Pocket
181	General Travels	?	?	0.4	40	80							Drift
182	General Travels	?	?	0.01	20	80							Drift

Cont. overleaf

Results of Cyclical Measurement of Noise Exposure Index (short measurement) (Cont)

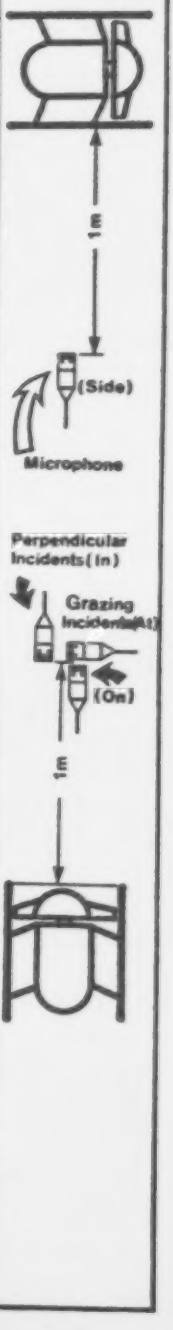
No.	Occupation	Protection		O.S.H.A. % Exposure	Sampling Time (min)	Leqs (dBA)	Unit Measured	Total Day Units	O.S.H.A. % Exposure (8 hr)	Leq (dBA)	Peak SPL (dBA)	Equipment	Operation
		Plugs	Muffs										
183	General Travel*	?	?	0.3	30	80							Drift
184	General Travel*	?	?	0.1	20	80							Drift
185	General Travel*	?	?	3.3	20	85.7							
186	General Travel*	?	?	1.4	22	81					98		
187	General Travel*	?	?	1.6	6	92					95		
188	General Travel*	?	?	0.2	3	90.9						Diesel Motor	Drift
189	General Travel*	?	?	0.4	2.75	92.6						Diesel Motor	Drift
190	General Travel*	?	?	0.3	3.50	85.9						Diesel Motor	Drift

* Surface Travel

Results of Short Time Measurements of the Equivalent Sound Level Peak Sound Pressure Level of Different Fans

No.	Equipment	Position of Microphone +				O.S.H.A. Exposure	Sampling Time (min)	L_{eq} [dBA]	Peak SPL (dBA)	Operation
		In	On	Side	At					
1	Woods fan					18.4	3	116	116	Incline/Decline
2	Woods fan					18.4	3	116	116	Incline/Decline
3	Woods fan	●				19.7	3	115.7	116	Incline/Decline
4	?					32	5.08	115	118	Incline/Decline
5	?					36	4.67	115	118	Incline/Decline
6	Woods fan	●				29.7	5	114.9	116	Incline/Decline
7	?					30	5	114.5	118	Incline/Decline
8	Woods fan	●				15.7	3	113.5	114	Drift
9	Woods fan	●				10.5	3	113.1	114	Noise
10	Woods fan	●				14.4	3	112.1	114	Drift
11	Woods fan	●				14.4	3	112	114	Noise
12	Woods fan	●				10	3	110.7	111	Drift
13	Woods fan	●				9.5	3	109.6	111	Drift
14	Aux. fan	●				7.9	3	108.9	110	Drift
15	Joy fan	●				7.8	3	108.8	110	Trackless Drift
16	Woods fan	●				2C	8	108.5		Trackless Drift
17	Woods fan	●				5.2	2	108.5		Trackless Drift
18	Woods fan	●				5.2	2	108.5		Trackless Drift
19	Aux. fan	●				7.8	3	108.4	110	Drift
20	Joy fan	●				12.7	5	108.4	110	Trackless Drift
21	Woods fan	●				12.3	5	108.3	110	Incline/Decline
22	Woods fan	●				13.1	5	108.3	110	Incline/Decline
23	Woods fan	●				7.2	3	108.2	110	Incline/Decline
24	Woods fan	●				7.6	3	108.1	110	Incline/Decline
25	Woods fan	●				7.6	3	108.1	110	Incline/Decline
26	Woods fan	●				7.8	3	108		Trackless Drift
27	Woods fan				●	7.6	3	107.7	110	Drift
28	Woods fan				●	6.2	3	107.6	108	Noise
29	Woods fan	●				6.4	3	107.1	108	Drift
30	Woods fan					6.4	3	107.1	106	Noise
31	Woods fan	●				6.3	3	107	107	Stope
32	Woods fan	●				6.4	3	106.9	107	Stope
33	Aux. fan			●		10	5	106.8	105	Trackless Drift
34	Woods fan				●	6.7	3	106.7	107	Drift
35	Woods fan				●	9.6	5	106.6	106	Incline/Decline
36	Woods fan				●	1.8	1	106.6	106	Incline/Decline
37	Woods fan	●				9.8	5	106.3	105	Trackless Drift
38	Woods fan				●	5.[illegible]	3	106.3	106	Incline/Decline
39	Woods fan	●				5.6	3	106.1	106	Noise
40	Aux. fan			●		9.3	5	105.9	105	Incline/Decline
41	Aux. fan					5.7	3	105.9	106	Drift
42	Aux. fan				●	9.3	5	105.9	105	Incline/Decline
43	Woods fan			●		5.4	3	105.8	105	Incline/Decline
44	Aux. fan	●				15.5	8	105.4	109	Incline/Decline
45	Aux. fan			●		3.4	2	105.3	105	Incline/Decline
46	Woods fan	●				5	3	105.3	105	Trackless Drift
47	Woods fan				●	4.00	3	105	105	Trackless Drift
48	Aux. fan	●				3.3	2	105	105	Incline/Decline

+ Note:



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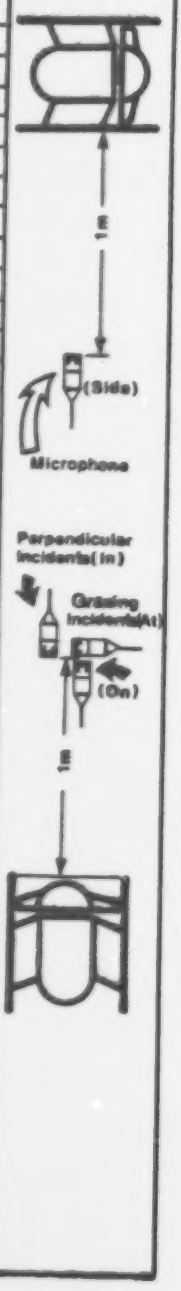
Results of Short Time Measurements of the Equivalent Sound Level Peak Sound Pressure Level of Different Fans (Cont)

No.	Equipment	Position of Microphone +				O.S.H.A. Exposure	Sampling Time (min)	Leqs (dBA)	Peak SPL (dBA)	Qperation
		In	On	Side	At					
49	Aux. fan			●		5.1	3	105	105	Incline/Decline
50	Aux. fan	●				4.7	3	104.8	109	Drift
51	Aux. fan			●		3.7	2	104.2	103	Noise
52	Woods fan				●	4.3	3	104.1		Steps
53	Joy fan	●				4.1	3	103.9	106	Incline/Decline
54	Joy fan		●			2.3	2	103.9		Trackless Drift
55	Joy fan			●		6.7	5	103.7	103	Incline/Decline
56	Aux. fan	●				6.7	5	103.7	106	Incline/Decline
57	Woods fan				●	3.9	3	103.6	103	Incline/Decline
58	Woods fan				●	3.9	3	103.6	103	Incline/Decline
59	Joy fan	●				13.1	10	103	106	Incline/Decline
60	Woods fan				●	1.1	1	102.9	103	Incline/Decline
61	Woods fan				●	5.8	5	102.7	103	Incline/Decline
62	Joy fan	●				2.4	2	102.7	106	Incline/Decline
63	Aux. fan	●				6.1	5	102.4	110	Noise
64	Woods fan	●				3.1	3	102.4	103	Noise
65	?					5.7	4	102	105	Trackless Drift
66	Woods fan				●	3	3	101.8		Noise
67	Woods fan				●	1	1.25	101.2		Drift
68	Aux. fan			●		2.7	3	101.1	101	Drift
69	Aux. fan			●		1	1.19	101		Drift
70	Woods fan	●				2.7	3	101	101	Drift
71	Aux. fan					1.6	1.9	100.9		Drift
72	Aux. fan					4.7	5	100.8		Drift
73	Aux. fan			●		3.9	3	100.8	103	Noise
74	Woods fan	●				3.4	3	100.5	103	Noise
75	Aux. fan					2.5	3	100.2		Drift
76	Woods fan				●	2.3	3	100	105	Trackless Drift
77	Aux. fan			●		4.3	5	99.9	101	Drift
78	Woods fan				●	2	2.5	99.9	101	Drift
79	Woods fan	●				2.3	3	99.1	102	Drift
80	Woods fan	●				2.2	3	98.9	101	Drift
81	Woods fan	●				2	3	98.5	102	Drift
82	Woods fan				●	2	3	98.4	99	Noise
83	Woods fan	●				3.3	5	98	101	Drift
84	Woods fan	●				1.5	2.5	97.7	98	Drift
85	?					9.5	15	97.5		Trackless Drift
86	Woods fan	●				1.3	2	97.1	101	Drift
87	Woods fan	●				2.2	4	96.8	98	Drift
88	Woods fan				●	1.1	3	93.8	95	Drift
89	Woods fan				●	1.2	3	91.8	96	Drift
90	Woods fan	●				2.1	6	93.8	94	Drift
91	Woods fan	●				1.6	5	93	94	Drift
92	Woods fan				●	1	3.17	92.9	95	Drift
93	Woods fan				●	1.2	4	92.3	95	Drift
94	Woods fan					1	4.07	90.3	90	Drift
95	Woods fan				●	1	5.07	88.6	89	Drift

+ Note:



VOL. 3 A Report 6

82-78 D.J. SAWYER, M.U. Savich

and D. O'Connor

Noise measurement of auxiliary fans

at Stanleigh Uranium Mine

in Elliot Lake

1982

MESURE DU BRUIT DES VENTILATEURS AUXILIAIRES DE LA MINE D'URANIUM STANLEIGH À ELLIOT LAKE

D.J. Sawyer*, M.U. Savich** et D. O'Connor+

RÉSUMÉ

On a fait des mesures du bruit émis à partir de trente-neuf ventilateurs auxiliaires à la mine d'uranium Stanleigh, qui est présentement rouverte. Le niveau de bruit moyen de tous les ventilateurs est de 110,41 dBA.

On a fait une comparaison pour différents ventilateurs. Le meilleur résultat a été obtenu pour un ventilateur de 75 HP muni de deux silencieux et d'un couvercle de boîtier atténuateur.

Une étude des ventilateurs a montré que leur entretien est très bien fait à la mine, étant donné que la différence de L_{eq} de crête est assez constante pour tous les types de ventilateurs (valeur moyenne de 11,76 dB).

On a étudié la relation entre le bruit des ventilateurs et l'IEB. La question des crêtes a été analysée. L'analyse a mené à la proposition d'un nouveau champ d'étude : étude des valeurs de crête et de leur effet sur l'IEB.

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NOISE MEASUREMENT OF AUXILIARY MINE FANS AT STANLEIGH URANIUM MINE IN ELLIOT LAKE

by

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ABSTRACT

Noise measurements were taken from thirty-nine auxiliary mining fans at Stanleigh uranium mine,which is being reopened. The average noise level of all fans is 110.41 dBA.

A comparison of various fans was made. The best performance was achieved with a 75 hp fan using two silencers and an attenuating casing cover.

A study of the fans reveals that the fan maintenance is very good at the mine as the peak L_{eq} difference is fairly constant for all types of fans (11.76 dB average value).

The relationship between fan noise and NEI was studied. The question of peaks was discussed. This discussion resulted in the suggestion of a new field of study - investigation of peak values and their effect on NEI.

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CONTENTS

	Page
ABSTRACT	i
INTRODUCTION	1
INSTRUMENT	1
FANS	4
MEASUREMENTS	6
CONCLUSION	11
ACKNOWLEDGEMENTS	11
REFERENCES	12

TABLES

No.		
1.	Technical specifications of underground auxiliary fans at Stanleigh mine	7
2.	Summary of noise data of auxiliary mining fans	8

FIGURES

1.	The Brüel and Kjaer Type 225 Sound Level Meter and aluminum case	3
2.	Examples of noise generating installations	5
3.	Graph of Leq and PEAK values for all fans at Stanleigh mine	10

APPENDICES

A-1.	Stanleigh mine, 1800 level, noise survey	A-13
A-2.	Stanleigh mine, 3500 level, noise survey	A-14
A-3.	Stanleigh mine, 3600 level, noise survey	A-15
A-4.	Stanleigh mine, 3700 level, noise survey	A-16
A-5.	Stanleigh mine, 3900 level, noise survey	A-17
B.	Noise measurement data of all fans	B-18
C.	Program to determine Log. average	C-21

INTRODUCTION

Stanleigh uranium mine in Elliot Lake has recently been reopened and is being prepared for renewal of ore production on a large scale. Stanleigh mine has five levels (Appendix A-1 to A-5).

Noise measurements were taken from 40 of the underground auxiliary mine fans manufactured by Davidson (29 fans), Woods (6 fans), Engart (4 fans) and Joy (1 fan). Five fans were either inaccessible or idle. Two fans were measured after a change in fan installation.

The purpose behind the measurements was to:

a) make a direct comparison of various fans

b) see if maintenance was required on any fans

c) see the relationship between fan noise and noise exposure index (NEI).

All data available on the fans is in English units because this system is still used by Stanleigh mine and the fan companies.

INSTRUMENT

All measurements were taken using the Brüel and Kjaer Integrating Sound Level Meter Type 2225 using a half-inch condenser microphone. The 2225 was designed to assess hearing damage risk and has a choice of four functions:

a) 60s L_{eq}, for a short term average value

b) FAST, for normal sound level measurement

c) SLOW, when the display fluctuates too rapidly to use FAST

d) PEAK, which holds the maximum peak value occurring before the instrument is reset.

The PEAK function uses a rise time of 30 μs, which is very important for hearing damage risk assessment. The 2225 also has D.C. output capability

used for permanent documentation using a Level Recorder (Fig. 1)(1).

The Noise Survey Form was designed and produced in book form to be used with the aluminum case (Fig. 1). The form has one column for the important value of L_{eq} and three columns to use for SLOW, FAST and PEAK values should these measurements be required.

The Sound Level Meter (SLM) was carried in an aluminum case designed to allow the SLM to be used and read while reducing the possibility of damage to the instrument. The case also has an antenna with a clip at its end (Fig. 1). The microphone is placed in this clip and the antenna extended to allow remote placement of the microphone. This feature is used for:

a) practical measurements of noise sources (fans, machines, etc.).

b) short measurements of Noise Exposure Index (NEI) of miners or workers in general. This is done by placing the microphone next to the miner's ear. This allows the technician to remain safely out of the immediate work area and lets the miner work undisturbed.

c) measuring the efficiency of ear muffs. This is done by taking a noise measurement with the microphone placed under the earmuff next to the ear and then taking a measurement near the ear outside the earmuff. The difference between these two values is the attenuation of the earmuffs, assuming the noise level remains constant. The case and SLM can be used in conjunction with a Level Recorder and worn by an operator to measure the NEI of an LHD operator, for example, while the technician waits in a safer area.

The case also has a wide strap allowing the SLM to be carried over a shoulder for easy 'hands-off' transportation of the SLM and case. The case was built at the Elliot Lake Laboratory.

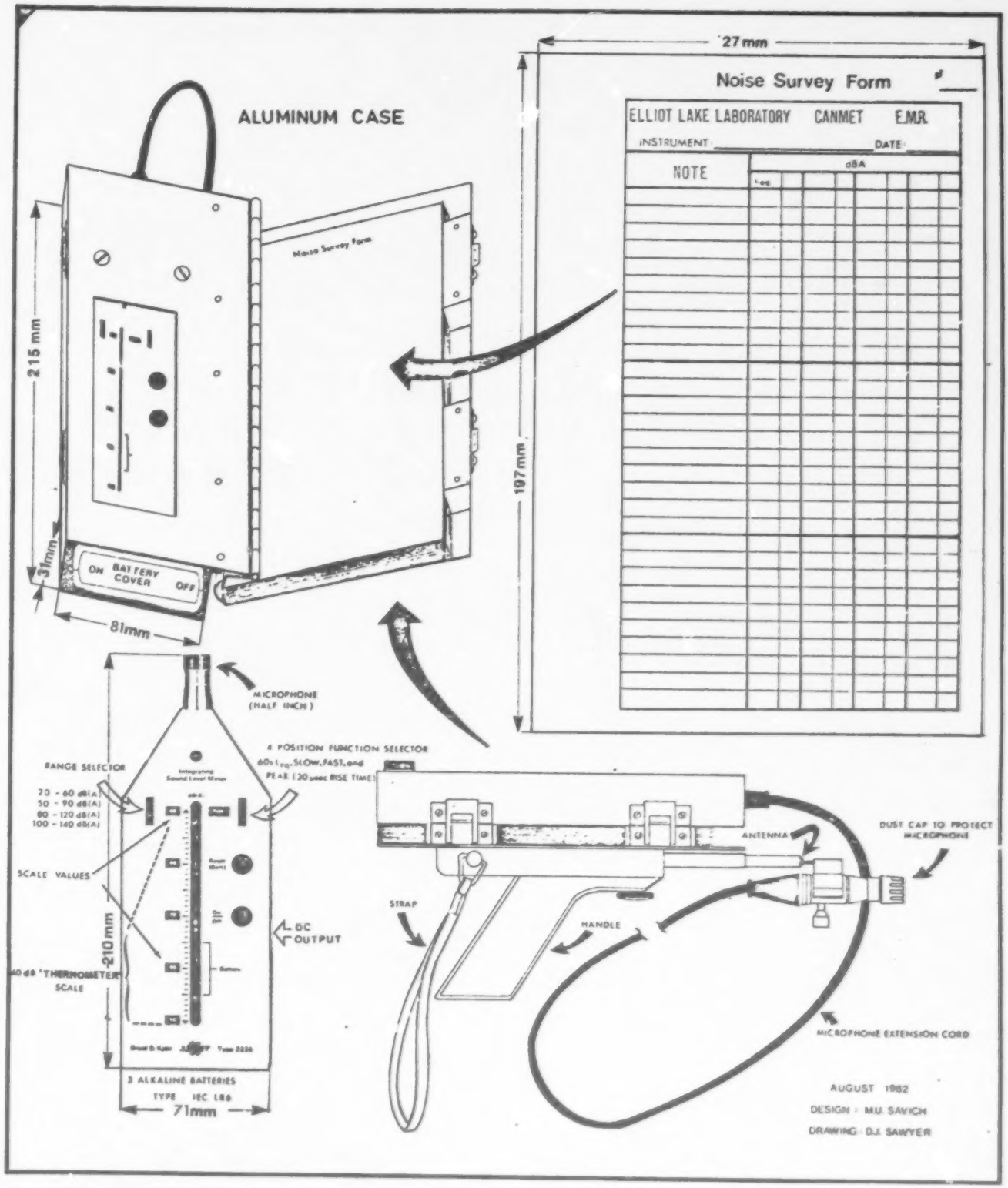


Fig. 1 - The Brüel and Kjaer Type 2225 Sound Level Meter and aluminum case.

FANS

Fans produce noise in two ways:

a) aerodynamic noise caused by air moving and being moved

b) machinery noise.

This noise is transmitted in 4 ways (2):

1) sound radiated from inlet and outlet

2) sound radiated through the fan casing

3) sound radiated through the ducts

4) sound induced by vibration transmitted to adjoining structures.

The noise can be reduced in several ways (3):

1) Choosing the fan so that it runs with optimum blade angle at peak efficiency (which is also the region of lowest noise output). Efficiency curves are available from fan manufacturers and should be consulted.

2) The use of add-on silencing devices.

3) Proper installation and maintenance.

Figure 2 shows the three sources of turbulence and the steps taken to eliminate them. This is a good example of proper installation. Silencers are effective, however, if the silencer becomes damaged (i.e., is hit and dented by large machinery) airflow is adversely affected (4). The fans must be mounted so as to present as small a target as possible.

In the category of add-on silencers are the inlet flare and the outlet cone. Both increase efficiency by reducing turbulence and must be used if the fans are to operate at peak performance (4). Induced vibration, i.e., the drumming of canvas, can only be stopped by damping the driving vibration i,e., through the use of a rigid mounting system (3).

Research has been done by the manufacturers to find the optimum operating region for each fan. More detailed information on operating

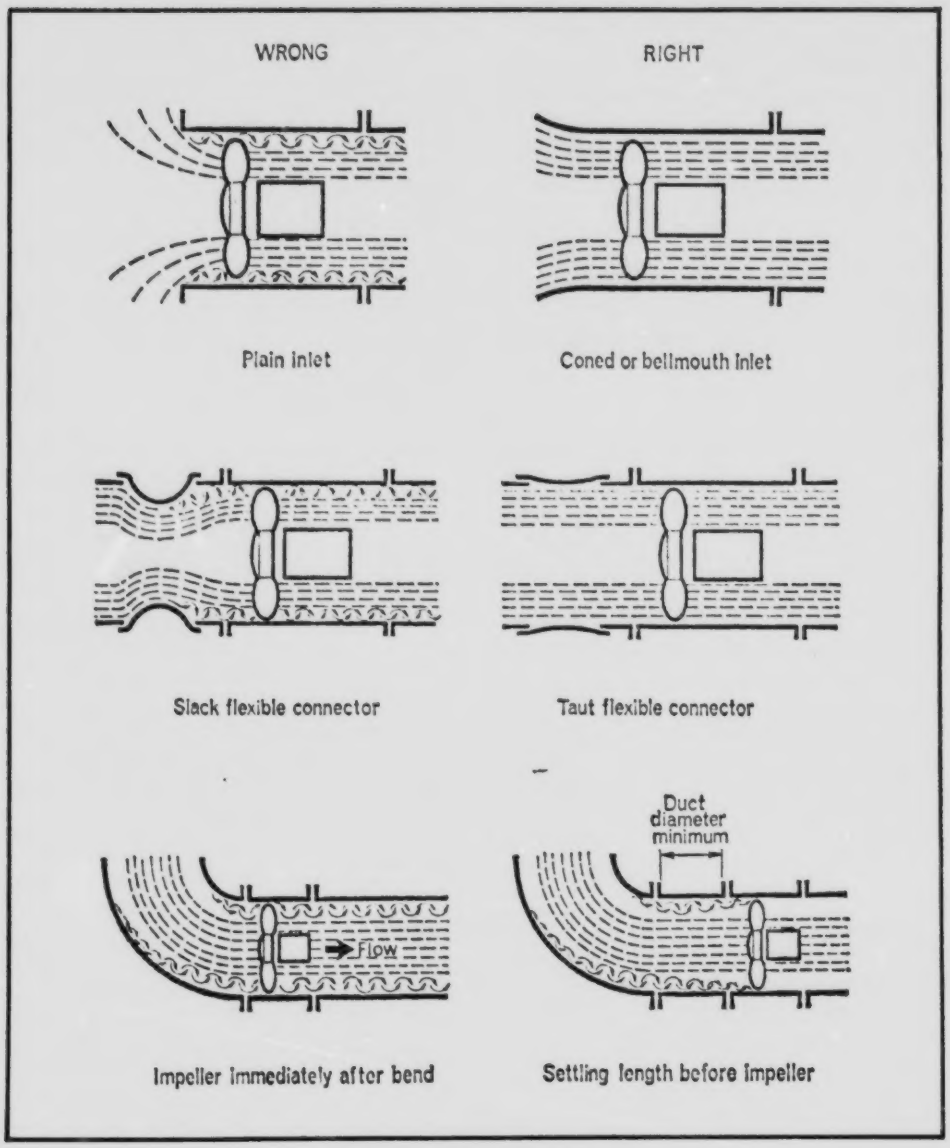


Fig. 2 - Examples of noise generating installations (Woods literature).

specifications for auxiliary mining fans and silencers is available from the fan manufacturers (Table 1).

MEASUREMENTS

The measurements taken underground at the mine were made on five different levels (Appendices A-1 to A-5). The numbers on the Appendices represent the locations of fans. These numbers are also used in Appendix B which contains the data on the fan sound levels.

Measurements were taken using the following method. The microphone was held one metre from the fan (perpendicular distance from the casing) and held facing the fan (Appendix B, see microphone position). This position is denoted as SIDE 1. The microphone was then moved to a position in front of and below the fan inlet one metre from the fan at a 45° angle from the verticle plane of the inlet. This position is denoted as SIDE 2 (Appendix B). Four measurements were taken at each position -60s L_{eq}, SLOW, FAST and PEAK.

Forty-six fans are listed in Appendix B. Only 40 of these were actually measured: 29 Davidson, 6 Woods, 4 Engart and 1 Joy. Two fans were measured twice (numbers 41 and 42). Six fans were not measured because the fan was inaccessible, idle or simply forgotten.

The data from Appendix B was then arranged in terms of manufacturer and fan diameter (Table 2). The logarithmic average of each of the four measurements were calculated. Logarithmic average was used, instead of mean and standard deviation, because it describes more realistically the effect on hearing damage risk in logarithms, as is the actual hearing mechanism.

To calculate the log. average of a group of numbers the following expression was used (5):

$$\overline{SPL} = 10 \log \left[\frac{1}{h} \sum_{i=1}^{n} \text{antilog} \frac{SPLi}{10}\right] \qquad \text{Eq 1}$$

Table 1 - Technical specifications of underground auxiliary fans at Stanleigh mine

Make	Woods	Davidson	Davidson	Woods	Davidson	Joy	Engart
Size	12"	20"	22½"	24"	36"	38"	48"
Model	12KG	Snipe fan 20-6BM	N570/15-9B	24KG	N36-75	9F3575M	48B125/LC/50
Blade setting	NA	10.5°	+5	Fixed at 16°	NA	NA	NA
R.P.M.	NA	3500	3500	3550	1875	1770	1780
Amps	NA	10	NA	32	71	61	130
B.H.P.	NA	10	20	32.0	75	50	125
Volts	NA	575	575	575	575	575	575
Hertz	NA	60	60	60	60	60	60
Phase	NA	3	3	3	3	3	3
Note						Type K	Motor type FJ (Brook Crompton)

Table 2 - Summary of noise data of auxiliary mining fans

Fan Type	# of Tests	Fan Size	Fan HP	Position	Logarithmic Average in dBA			
					L_{eq}	Slow	Fast	Peak
Woods	4	12"	0.35	Side 1	89.93	89.89	90.86	100.35
	2			Side 2	93.60	92.60	92.61	104.60
	6			Total	91.78	91.18	91.64	102.56
Davidson	8	20"	10	Side 1	104.25	103.98	104.13	114.24
	7			Side 2	103.11	103.61	103.28	116.06
	15			Total	103.79	103.83	103.78	115.13
Davidson	4	22½"	20	Side 1	105.23	102.85	103.05	114.92
	3			Side 2	99.34	98.95	98.53	110.32
	7			Total	103.57	101.57	101.64	113.49
Woods	3	24"	32	Side 1	113.34	113.00	112.84	125.84
	3			Side 2	113.17	113.00	113.27	126.50
	8*			Total	113.08	112.88	112.82	126.02
Davidson	18	36"	75	Side 1	110.58	108.80	109.32	119.75
	7			Side 2	115.24	114.37	114.79	126.74
	25			Total	112.45	111.18	111.64	123.01
Joy	2	38"	75	Side 1	103.70	103.60	103.62	114.64
	1			Side 2	102	102	102	115
	3			Total	103.21	103.13	103.15	114.76
Engart	2	48"	125	Side 1	112.03	111.81	111.81	125.03
	4			Side 2	113.50	112.50	113.50	125.50
	6			Total	112.58	112.06	112.45	125.19
Σ	70			Total	110.41			121.93

* Two measurements were taken from positions other than Side 1 or Side 2, and included in the "total" calculations.

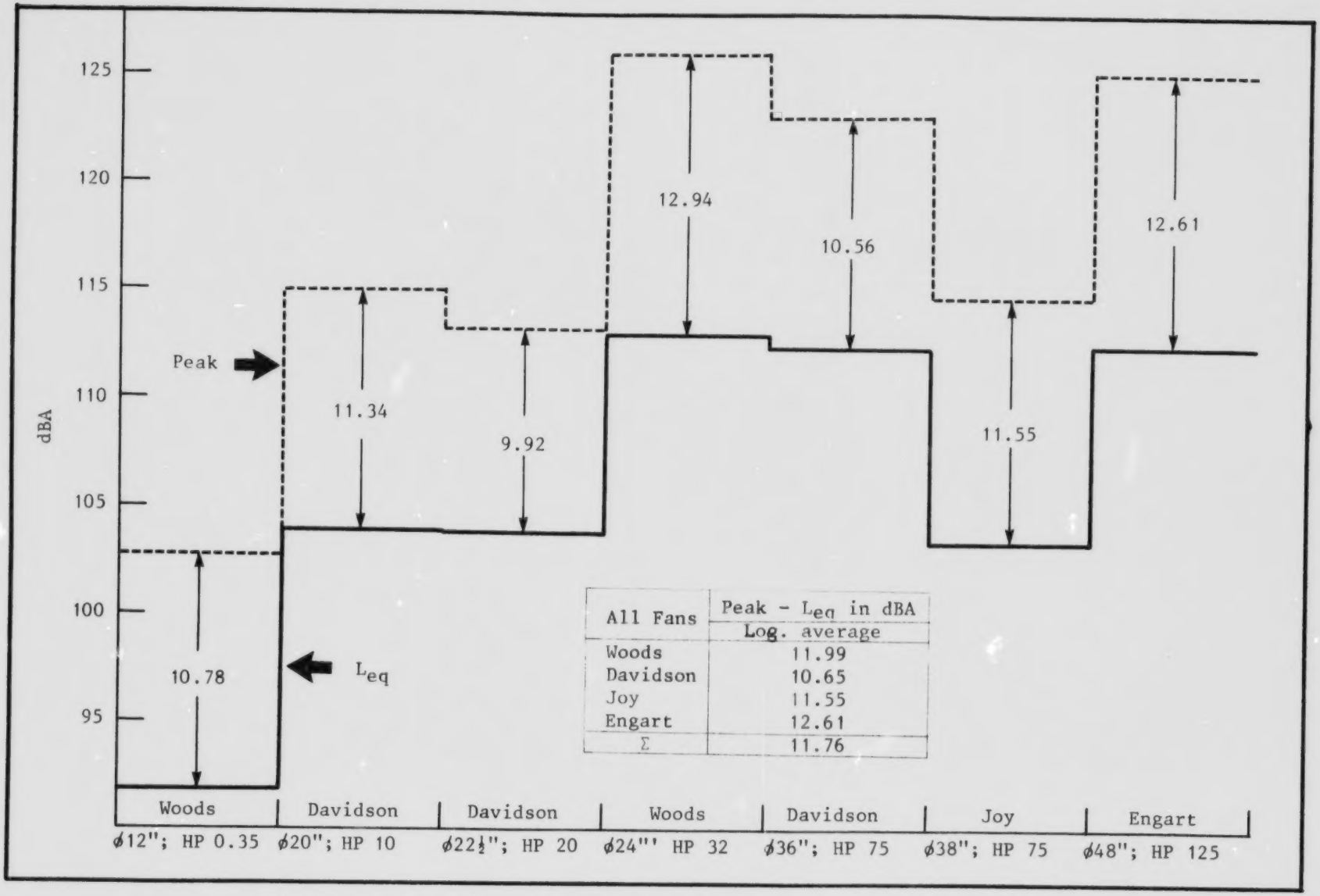
For the program used refer to Appendix C (Table 2). The average noise level from all fans is 110.41 dBA.

From the summary of fan data in Table 2, it can be seen that the SLOW and FAST values are either the same or very close. Only the PEAK value is higher by approximately 10 to 13 dBA. From Table 2 the graph in Fig. 3 was plotted to analyze the differences between Leq and PEAK values.

The best result in terms of noise level and peak level is the Joy fan equipped with two silencers and an attenuating cover over its metal casing. The PEAK value for the Joy fan is approximately equal to the Leq value for the other fans of comparable size and power. This installation therefore is very effective. The logarithmic average of the Peak, Leq difference for all fans is 11.76 dBA. Theories concerning the production of peak noise are difficult to make because of a lack of hard data due to a lack of instruments capable of PEAK measurement. The B and K 2225 does measure PEAK values and uses a rise time of 30 μs which is very good. However, the 2225 records only the greatest peak value before the machine is reset. Certainly, we do not have data on how many peaks there have been of any given strength. A chart recorder cannot be used because they cannot move fast enough to accurately record peak values.

Acoustic impulses of extremely short duration, which may be intense enough to contribute to hearing damage, may sound relatively quiet to the observer, and therefore the possibility of a hearing hazard be overlooked (6). The pulses sound quieter because the shorter the duration of the pulse, the less sound there appears to be to an observer because of the way the ear mechanism works.

The energy of the peaks does affect the ear and hearing damage can result. An instrument is needed which will measure the number of peaks as well as their magnitude for any given time period. The rise time of such an



All Fans	Peak - L_{eq} in dBA Log. average
Woods	11.99
Davidson	10.65
Joy	11.55
Engart	12.61
Σ	11.76

Fig. 3 - Graph of L_{eq} and PEAK values for all fans at Stanleigh mine

instrument should be as small as possible and certainly no larger than 20 ms to 640 ms (7).

CONCLUSION

The measurements taken of auxiliary mining fans at Stanleigh mine show that the difference in sound levels between fans is largely dependent on fan size and power. The average noise level of all fans is 110.41 dBA. Silencers for fans can be very effective, e.g., the case of the Joy fan. Similar techniques should be used with most or all fans in working areas of the mine.

All measurements show that maintenance in the mine (on fans) is very good. The highest peak level or the greatest difference between PEAK and 60 L_{eq} is approximately 13 dBA. The average difference is 11.76 dBA (Fig. 3). These values are close which is good.

At this time we have no theories as to what causes these peak values and this should be investigated.

Now a new element in the study of noise becomes apparent. This is the PEAK noise level measurement which should be taken into consideration in evaluating the noise exposure index (NEI) of workers.

There are little available data on peaks and the peaks should be examined in fans and all mining equipment.

ACKNOWLEDGEMENTS

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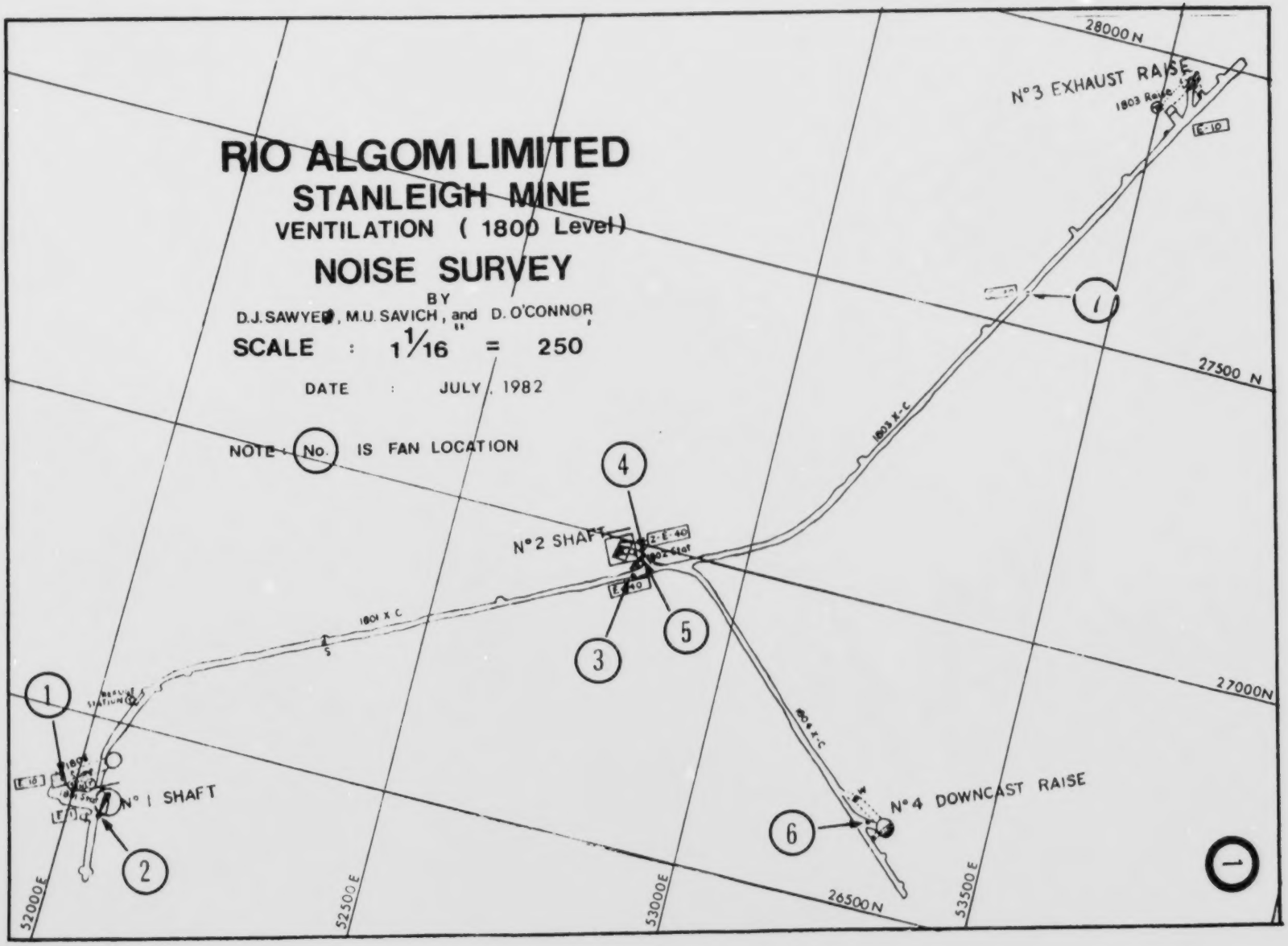
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STANLEIGH MINE
VENTILATION (1800 Level)
NOISE SURVEY
BY
D.J. SAWYER, M.U. SAVICH, and D. O'CONNOR
SCALE : 1 1/16" = 250'
DATE : JULY, 1982
NOTE : (No.) IS FAN LOCATION
28000 N
27500 N
27000N
26500N
52000E
52500E
53000E
53500E
N°3 EXHAUST RAISE
1803 Raise
E-10
1803 X-C
N°2 SHAFT
2-E-40
1802 Station
E-40
1801 X C
1804 X-C
N°1 SHAFT
E-18
E-5
N°4 DOWNCAST RAISE
1
2
3
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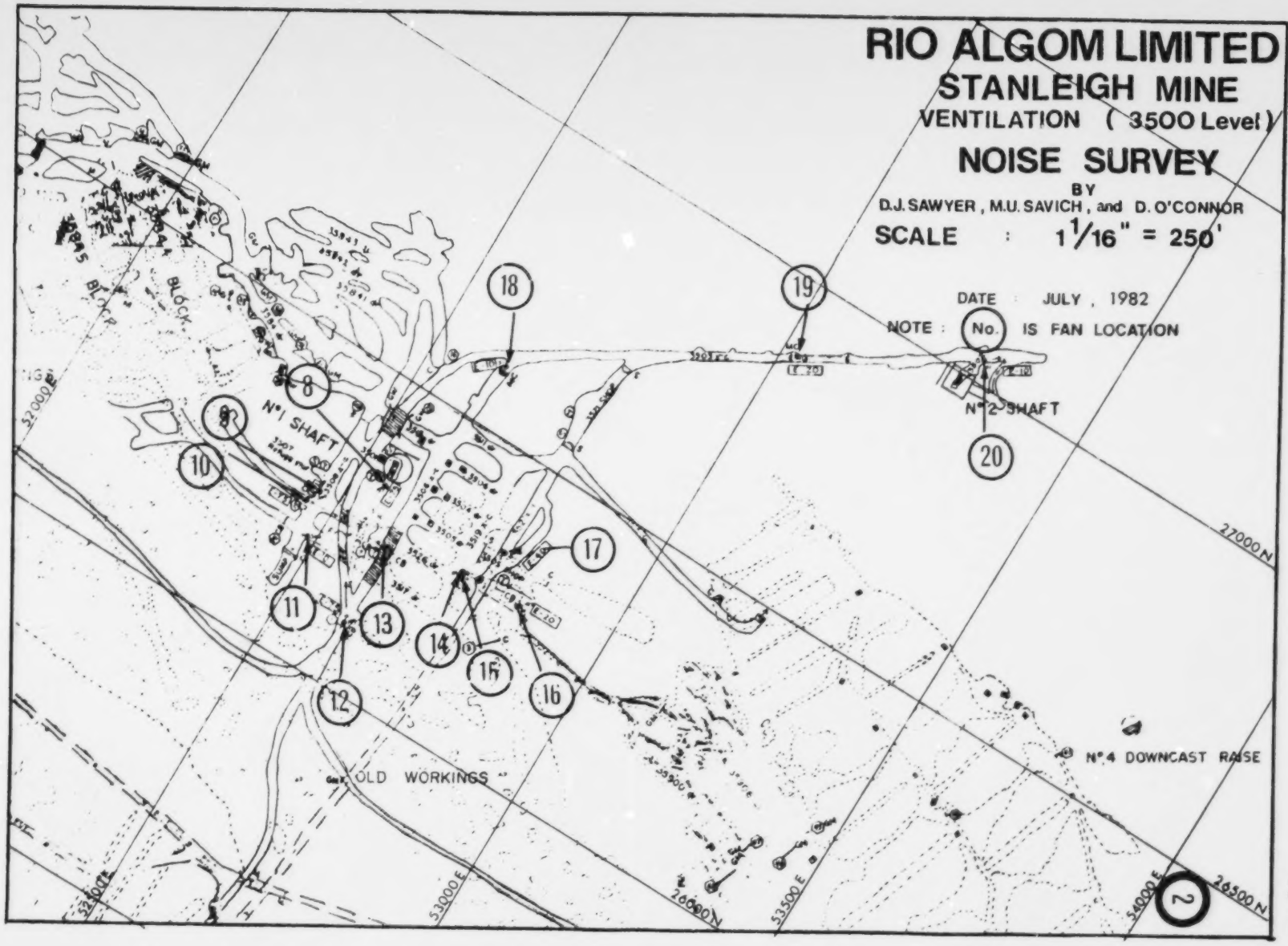
6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STANLEIGH MINE
VENTILATION (3500 Level)
NOISE SURVEY
BY
D.J. SAWYER , M.U. SAVICH , and D. O'CONNOR
SCALE : 1 1/16" = 250'
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N° 2 SHAFT
N° 4 DOWNCAST RAISE
OLD WORKINGS
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BLOCK
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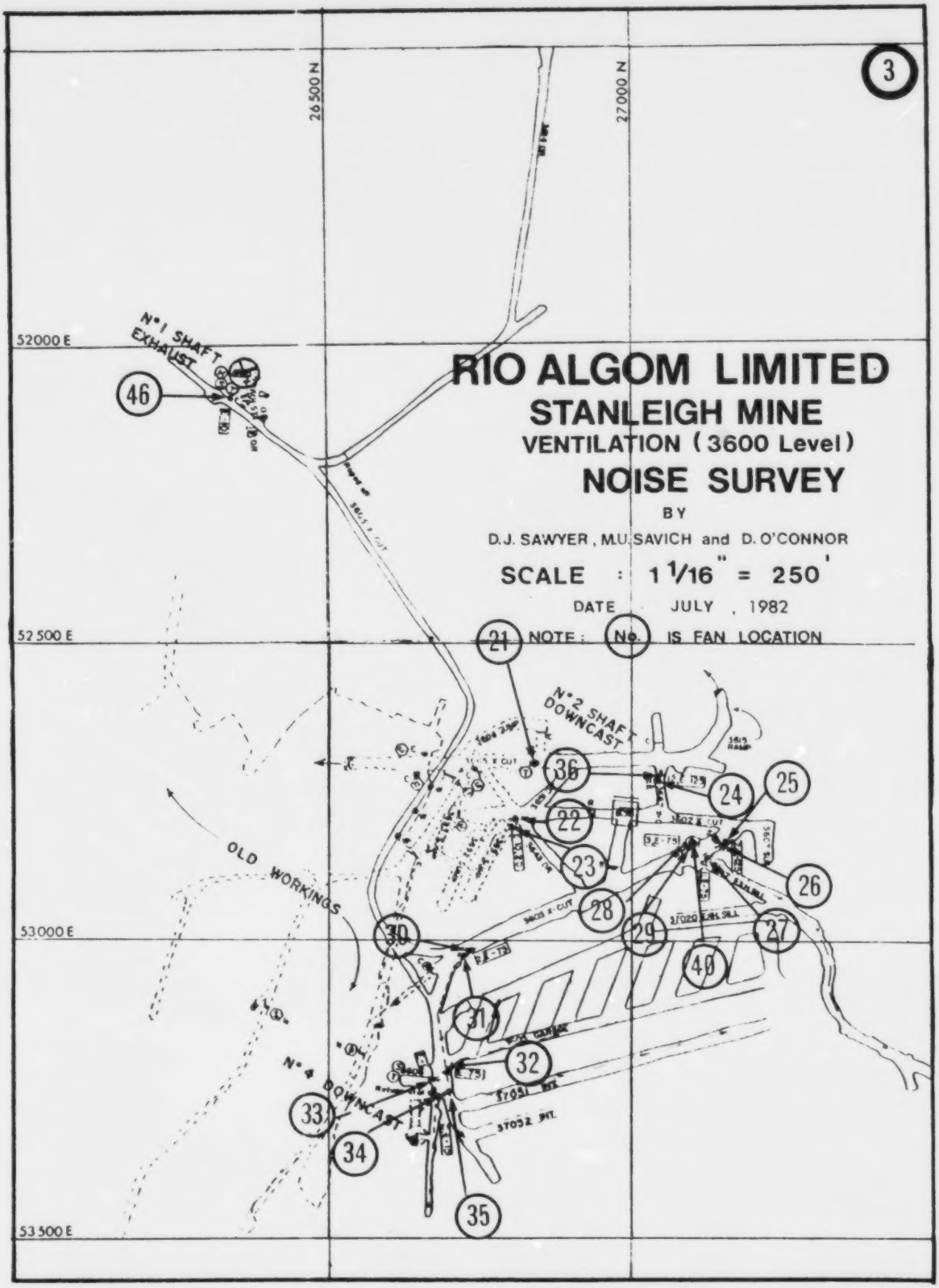
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46
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STANLEIGH MINE
VENTILATION (3600 Level)
NOISE SURVEY
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DATE JULY , 1982
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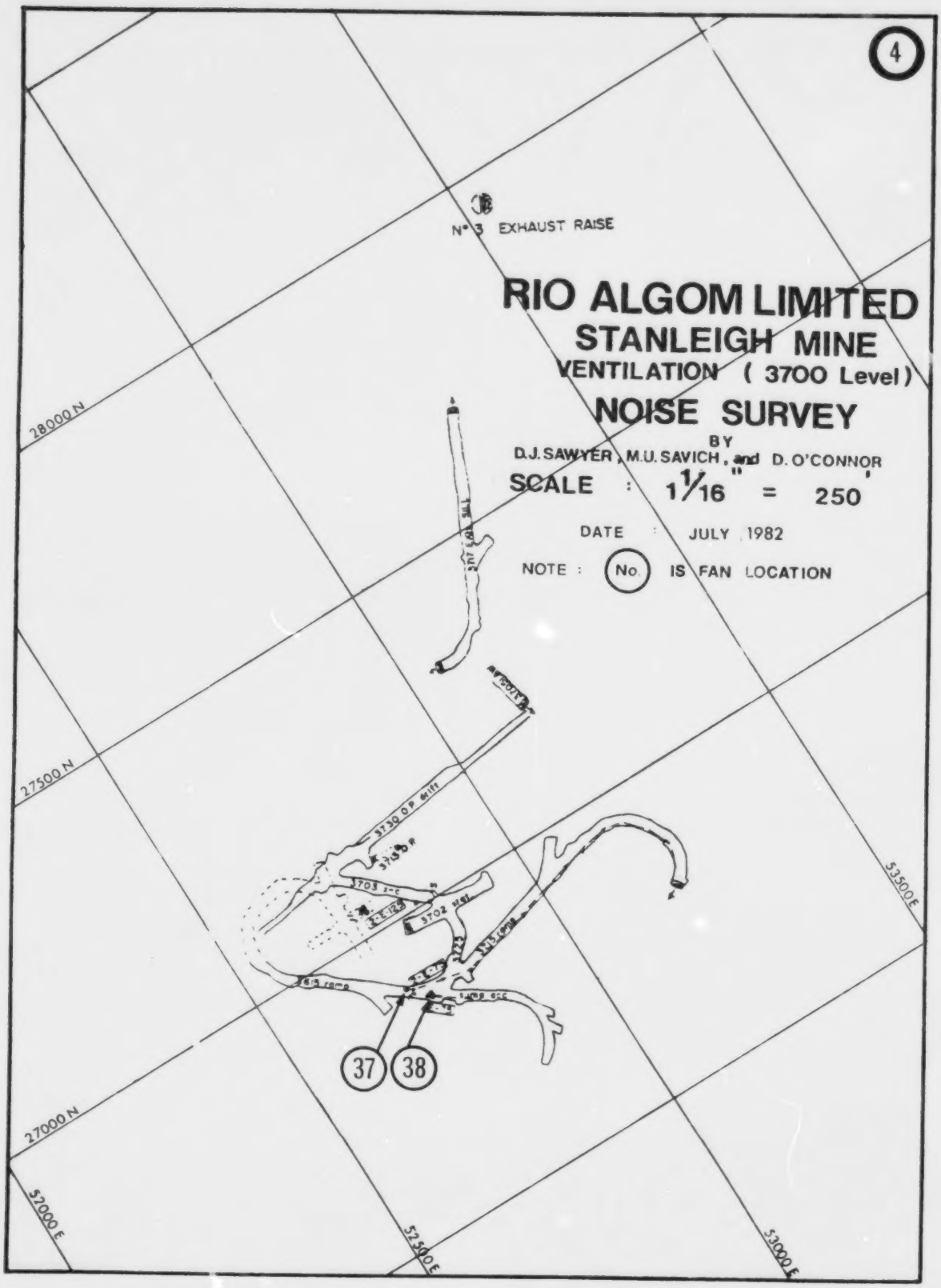
OLD WORKINGS
N°4 DOWNCAST


4
N°3 EXHAUST RAISE
RIO ALGOM LIMITED
STANLEIGH MINE
VENTILATION (3700 Level)
NOISE SURVEY
BY
D.J. SAWYER, M.U. SAVICH, and D. O'CONNOR
SCALE : 1 1/16 " = 250 '
DATE : JULY 1982
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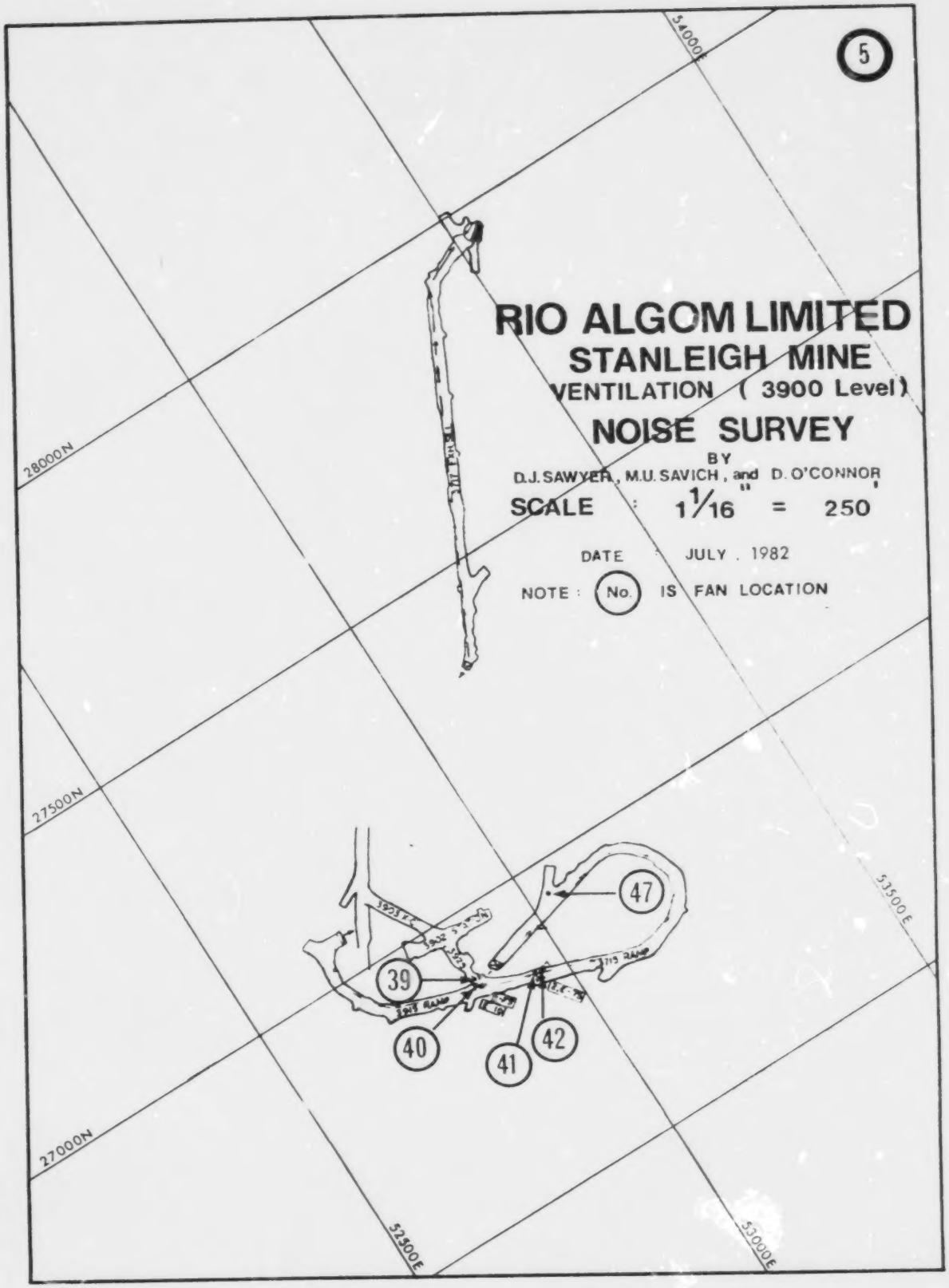
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RIO ALGOM LIMITED
STANLEIGH MINE
VENTILATION (3900 Level)
NOISE SURVEY
BY
D.J. SAWYER, M.U. SAVICH, and D. O'CONNOR
SCALE : 1 1/16" = 250'
DATE : JULY . 1982
NOTE : (No.) IS FAN LOCATION
47
39
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42

Noise measurement data of all fans

Fan No.	No. of Fan	Fan		H.P.	Microphone Position +		dBA				Note
		Type	Size		Side 1	Side 2	L_{eq}	Slow	Fast	Peak	
1	38-7 305	Davidson	20"	10	o		95.5	95	95.5	100	1800 Sump
						o	109	110	109.5	122	
2	304	Woods	12"	0.35	o		68	67	67.5	81	1801 Station
3	SA-4 104	Woods	24"	32	o		113	113	112.5	125.5	1804 X-cut
						o	113.5	114.5	114.5	128	
4	SA-1 101	Woods	24"	32	o		113.5	113	111	126	1802 Station
		(101 was next to 105)				o	113	112	11..5	125.5	
							112.5	112.5	11.	125.5	Taken next to both
5	SA-2 105	Woods	24"	32	o		113.5	113	11..	126	1802 Station
						o	113	112	112.5	125.5	
		(105 was next to 101)					112.5	112.5	112	125.5	Taken next to both
6	SB-12 308	Davidson	20"	10	Not running - idle						1805 X-cut
7	SA-3 103	Woods	24"	32	Inaccessible						1803 X-cut
8	SD-13 193	Davidson	36"	75	o		104.5	105.5	105	116.5	3501 Exhaust fan
9	501	Woods	12"	0.35							3507 Refuge
10	198	Davidson	36"	75							3508 X-C Plenum Exchange
11	302	Davidson	20"	10	o		98.5	97	9.	109	3508 Sump
						o	95	94	94.5	106.5	
12	199	Davidson	36"	75	o		103.5	102	102.5	114.5	
13	307	Woods	12"	0.35							3506 Electrical shop
14	116	Davidson	22"	20		o	99.5	100	99.5	111	3526 Drift
					o		94.5	93.5	96	106	
		(116 is next to 119)									
15	119	Davidson	22"	20		o	99.5	100	99.5	111	3526 Drift
					o		94.5	93.5	96	106	
		(119 is next to 116)									
16	117	Davidson	22"	20	o		92.5	92.5	9.	106	3505 Garage
17	201	Davidson	36"	40							3521 X-cut
18	311	Davidson	20"	10	o		103.5	103.5	103	115.5	Fuel bay
						o	104	104	103.5	115	
19	120	Davidson	22"	20	o		111	108.5	108.5	120.5	3503 X-cut doors
						o	99	95.5	95.5	108.5	
20	201	Davidson	20"	10	o		99	99	99	109.5	3503 X-cut
						o	99.5	99	99	110.5	
21	505	Woods	12"	0.35	o						3665 Sub-station
22	SA-15 115	Davidson	22"	20	not in operation - idle						3691 Sump
23	306	Davidson	20"	10	o		92..	93	93.5	106.5	3691 Sump
						o	1..	1.. 5	100.5	113.5	

Fan No.	Serial No. of Fan	Type	Size	H.P.	Microphone Position + Side 1	Side 2	dBA L_{eq}	Slow	Fast	Peak	Note
24	230	Engart	48"	125	o	o	111.5	111	111	124.5	3667 X-cut
		(230 was next to 227)									
25	226	Engart	48"	125	o	o	112.5 113.5	112.5 112.5	112.5 113.5	125.5 125.5	3603 X-cut
		(226 was next to 228)									
26	228	Engart	48"	125	o	o	112.5 113.5	112.5 112.5	112.5 113.5	125.5 125.5	3603 X-cut
		(228 was next to 226)									
27	SD-13 183	Davidson	36"	75	o		109.3	109	110	121.5	3717 Bottom Ramp Booster
28	SD-4 197	Davidson	36"	75	o	o	114 120	114 119	115 119.5	126 131.5	3713 Top Waste Pass
		(197 is next to 153)									
29	SD-14 189	Davidson	36"	75	o	o	114 120	114 119	115 119.5	126 131.5	3713 Bottom Waste Pass
		(189 is next to 197)									
30 ★	202	Joy	38"	75	o+ o	o	93.5 106.5 102	90.5 106.5 102	91.5 106.5 102	103 117.5 115	37051 Drift
		(202 was above 200)									
		+ measurement was taken with Fan 200 off.									
31	200	Davidson	36"	75	o	o	106.5 102	106.5 102	106.5 102	117.5 115	37051 Drift
		(200 was next to 202)									
32	SD-17 183	Davidson	36"	75	o	o	98.5 98	108.5 97.5	108.5 98	110 110.5	3605 Drift
33	508	Woods	12"	0.35	o	o	94.5 96.5	94.5 95.5	95.5 95.5	105 107.5	3606 Refuge
34	309	Davidson	20"	10	o	o	99.5 101	99.5 100.5	100 101	112 112.5	3604 Raise
35	310	Davidson	20"	10	o		108.5	108.5	109	110	3616 X-cut
36	227	Engart	48"	125		o	111.5	111	111	124.5	3667 X-cut
37	SD-1 185	Davidson	36"	75	o		105.5	105	104.5	112.5	3615 Bottom Ramp Run
38	SD-11 184	Davidson	36"	75	o		105.5	105	104.5	112.5	3615 Top Ramp Run
		(184 is next to 185) booster									
47	506	Woods	12"	0.35	o	o	81 80.5	80 79.5	80 80	89 91.5	3715 Sub-station
39	B-13 312	Davidson	20"	10			110.5	110	110	121.5	3925 Sub-station
40	SD-12 186	Davidson	36"	75	o	o	115.5 101.5	114.5 98	115 98	118.5 111	3925 Drift
		Readings done on different days									
		(186 is below 312)									

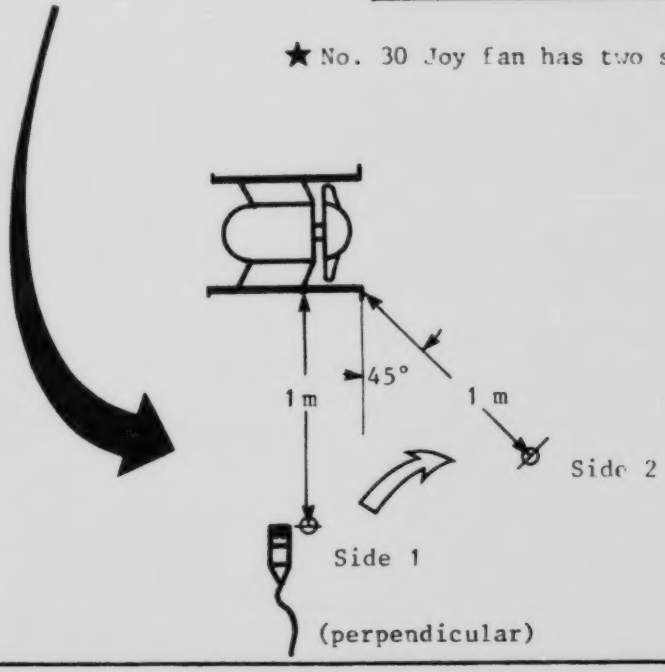
Fan No.	No. of Fan	Fan Type	Fan Size	H.P.	Microphone Position + Side 1	Microphone Position + Side 2	dBA L_{eq}	dBA Slow	dBA Fast	dBA Peak	Note
41	188	Davidson	36"	75	o		100.5	101	102.5	112	
					o		112.5	101.5	101	114	
		(188 is next to 187)									
42	SD-7 187	Davidson	36"	75	o		100.5	101	102.5	112	3715 Top Ramp Booster
					o		112.5	101.5	101	114	
*41	507 187	Davidson			o		111	110.5	110.5	123.5	3715 Top Ramp Booster
*42	507 188					o	111	111.5	111.5	123.5	Bottom Booster
43	SD-6 181	Davidson	36"	75	o		112.5	101.5	101	114	3915 Top Ramp Booster
44	SD-8 191	Davidson	36"	75	o		112.5	101.5	101	114	3915 Bottom Ramp Booster
		OORP									
		(191 is next to 181)									
45	SD-2 194	Davidson	36"	75	o		109	109	108.5	122	4102 Station
						o	112.5	112	111	123	
46	SB-8 307	Davidson	20"	10	o		97	97	97	109.5	3601 Station
						o	96	94.5	94.5	116.5	

*These measurements were taken at a later date. The first measurements were taken with ducting on intake and outlet. The second measurements were made with an open inlet.

Note: + microphone position.

SILENCER

★ No. 30 Joy fan has two silencers



Program to determine Log. average
for HP 41C:

```
PRGM
GTO ..
LBL
ALPHA LOGAV ALPHA
0.0
STO 14
0.0
STO 15
0.0
STO 16
LBL 01
ALPHA NUMBER?ALPHA
XEQ
ALPHA PROMPT ALPHA
X = 0 ?
GTO 02
10 ÷
10^x
RCL 14
+
STO 14
RCL 15
1 +
STO 15
GTO 01
LBL 02
RCL 14
RCL 15
÷
LOG
10 x
STO 16
RCL 15
R/S (Puts Stop in Program)
RCL 16
GTO .. (Puts in End)
```

Energy, Mines and Resources Canada

Énergie, Mines et Ressources Canada

CANMET

Canada Centre for Mineral and Energy Technology

Centre canadien de la technologie des minéraux et de l'énergie

Mining Research Laboratories

Laboratoires de recherche minière

Canada

NOISE AND VIBRATION IN MINES
RESEARCH REPORTS 1972-1986

edited by G. Knight *tradult par N.R Billette*

Volume 3B

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CANMET

Canada Centre for Mineral and Energy Technology | Centre canadien de la technologie des minéraux et de l'énergie

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LABORATOIRES DE RECHERCHE MINIÈRE
RAPPORT DE DIVISION LRM 88–118B (R)

TABLE OF CONTENTS / TABLE DES MATIÈRES

Volume 1 Introduction and Measurement Methods
Introduction et techniques de mesure

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Glossary xiii
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Development of an anechoic chamber–72–142 13
2. Development of a standard method for testing noise exposure–73–108 35
3. A new graphical method for the evaluation of noise exposure–74–23 83
4. Noise monitor hat–74–88 119
5. Performance analysis on noise dosimeters and noise exposure monitors–75–6 139
6. Characteristics of the personal noise dose meter type 4425 as exemplified by serial no. 453311–75–23 183
7. Simple method of evaluation of the noise exposure index and the equivalent continuous sound level–75–71 207
8. Characteristics of GR–1944 noise dosimeter in the laboratory and in the field–76–83 225
9. Simple graphical method of evaluation of the noise exposure index and the equivalent continuous sound level–76–94 251
10. Tests of a noise exposure monitor helmet–77–94 267
11. A significant advance in noise monitoring instrumentation–78–62 295
12. Development of a noise monitor hat–79–40 327
13. Noise measurement in mines–80–47 365
14. Noise measurement at Denison Mines–81–54 391
15. New generation of noise dosimeters in Canadian mines–81–106 435
16. How CANMET tests noise pollution–83–56 451

Volume 2 Hearing Protection–Ear Muffs
Protection de l'ouïe–Protecteurs de supra-auriculaires

Foreword i
Avant-propos iii
Abstract v
Résumé vii

Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Effects of noise on man and hearing protection–72–140 13
2. Ear muff noise attenuation in Canadian mines–78–11 55
3. Efficiency of ear muffs in mines–78–72 227
4. Laboratory attenuation of ear muffs used in mines–78–73 287
5. Noise reduction evaluation of ear muffs–78–74 359
6. The acceptability of ear muffs–78–75 387
7. Attenuation of ear muffs in Canadian mines–78–100 427
8. Practical problems of hearing protector use in Canadian mines–80–59 493
9. Attenuation of ear muffs in mines from practice to practice
–iz prakse za prakso–82–128 523
10. Clamping force durability test–84–35 541
11. Attenuation measurement of ear muffs at Falconbridge complex:
No. 5 shaft, the East Mine and the mill and smelter, 1984–86–58 553
12. Attenuation measurements of ear muffs at Lockerby Mine, 1984–86–59 583
13. Attenuation measurements of ear muffs at Strathcona Mine, 1984–86–60 609
14. Attenuation measurements of ear muffs at Fraser Mine, 1984–86–61 643
15. Attenuation measurements of ear muffs at Falconbridge mines, 1984–86–88 671

Volume 3 Mine Noise Surveys—Part A / Relevés de bruits de mines—Partie A

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Noise measurements in Denison Mines–73–122 13
2. Preliminary noise survey at a mine-smelter complex–74–150 73
3. Noise measurement of trucks in Brunswick Mining and Smelting
No. 6 site–open pit–76–79 117
4. Noise measurements in No. 12 mine, Brunswick Mining and Smelting–77–36 ... 151
5. Noise measurements in Quirke No. 2 mine, Rio Algom–80–26 325
6. Noise measurement of auxiliary fans at Stanleigh Uranium Mine–82–78 373

Volume 3 Mine Noise Surveys—Part B / Relevés de bruits de mines—Partie B

Table of Contents / Table des matières i
7. Measurement of noise exposure index of underground service workers at
Denison Mines–82–142 401

8. Measurement of noise exposure index of operators on haulage equipment from the underground operations at Denison Mines–82–143 615
9. Noise measurement on underground crushing equipment at Denison Mines–82–144 747

Volume 3 Mine Noise Surveys—Part C / Relevés de bruit de mines—Partie C

Table of Contents / Table des matières i
10. Measurement of noise exposure index of miners at drilling operations at Denison Mines–82–145 883
11. Short noise measurements on fans at Fraser and Strathcona mines–83–114 1245
12. Measurement of impulse noise of vehicles at the Stanleigh Uranium mine–84–83 1261
13. Personal noise dosimetry survey of various occupational groups at four Potash mines in Saskatchewan–86–122 1295

Volume 4 Mill and Surface Plant Noise Surveys—Part A
Relevés de bruits d'usines et atelier de surface—Partie A

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Noise measurement in the concentrator at Brunswick Mining and Smelting–76–91 . 13
2. Noise measurement in the crushing and screening plant at Denison Mines–81–50 . 109
3. Noise measurement in grinding plant and coarse ore storage at Denison Mines–81–51 147
4. Noise measurement on surface maintenance locations at Denison Mines–81–52 .. 251

Volume 4 Mill and Surface Plant Noise Surveys—Part B
Relevés de bruits d'usines et ateliers de surface—Partie B

Table of Contents / Table des matières i
5. Noise measurement in assay laboratory at Denison Mines–81–53 487
6. Noise measurement in the hydrometallurgical plant at Denison Mines–81–95 571
7. Noise measurement at shafts No. 1 and No. 2 at Denison Mines–83–45 893
8. Problems and solution of environmental noise at Indusmin–84–54 915

Volume 5 Noise Abatement / Études de réduction du bruit

Foreword i
Avant-propos iii
Abstract v

Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Production, characteristics and abatement of noise from light and medium rock drills–73–157 13
2. Noise attenuation in rock drills–75–39 71
3. Canada is one of the leading nations in noise abatement in mines–78–10 115
4. Diamond drill noise study: phase I–9–9023 139
5. Diamond drill noise study: phase II–0–9044 219
6. Abatement of noise and vibration in the Canadian mining industry–82–40 281
7. Cost effectiveness and technical feasibility of options available for sound-proofing diamond drilling equipment: phase III–1–9045 321
8. Noise attenuation with exhaust after treatment systems on a scooptram at Falconbridge's Strathcona mine–84–65 401
9. Practical work on the noise attenuation with exhaust after treatment systems on a ST4A scooptram–84–69 433

Volume 6 Vibration Studies and General / Études des vibrations et divers

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
Vibration Studies / Études des vibrations
1. A study of vibration sources affecting mine workers–1–9133 13
General and Unclassified / Divers
2. Noise and vibration in Canadian mines–73–17 155
3. Introduction to noise measurement–73–40 363
4. Measurement and control of noise in Canadian mines: a review and progress report–74–76 397
5. An acoustical method for source location of methane–80–57 433
6. Combustion-noise and vibration research projects–82–66 445
7. Looking ten years backward and ten years forward at the battle against noise and vibration in Canadian mines–83–28 475
8. Heliport at Sudbury hospital–83–61 491

Vol 3 B Report 7

82-142 M.U. SAVICH

Measurement of noise exposure index of underground service workers at Denison Mines Ltd. in Elliot Lake

1982

INTRODUCTION

Sixty-eight measurements of noise exposure index (NEI) were performed of which four were rejected, three because of high readings caused by high humidity and one reading which was discontinued after 6.5 hours because of a damaged microphone (Appendices 1 to 68). 93.75% L_{OSHA} were less than 90 dBA.

ANALYSIS OF MEASUREMENTS

This is a good example of where a man, the surveyor, has been replaced by a computer. The results show that only 6.25% exceed permissable noise levels (see Table 1). In short the situation is:

Participation L_{OSHA} in Percent

80-84 dBA	85-89 dBA	>90 dBA
35.94	57.81	6.25

Should the base line be changed to 85 dBA with a 5 dBA step, then 64% of the workers would be exposed to excessive noise levels. If the change of base line is accepted the work force exposed to the 85-90 dBA range would be transferred to the over-exposed category. This is an example of how a may assist in the discussion of the implementation of new regulations.

CONCLUSION

Only 6.25% of the work force, ventilation maintenance and pipe fitters must wear hearing protectors for an entire shift, others with exposures in the range of 85 to 89 dBA require periodic hearing protection. Others exposed to levels below 85 dBA (35.94%) do not require hearing protection. Ear plugs are sufficient protection for workers exposed to noise from machinery.

Table 1 - Results of L_{OSHA} and time during work day

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
1	4516	241	Gen. Serviceman	480	83.2	106	48	76	89	89	33	18	10	11	0	0	0	480	SHAFI
2	4416	241	Gen. Serviceman	480	85.7	254	72	39	33	28	20	7	7	7	8	5	0	480	SHAFI
3	4133	SMA	Gen. Serviceman	480	65.8	354	68	33	16	9	0	0	0	0	0	0	0	480	GENSE
4	4180	241	Gen. Serviceman	480	78	217	67	49	44	56	24	14	9	0	0	0	0	480	79
			Mean	480	82.09 ▲	232.75	63.75	49.25	45.5	45.50	19.25	9.75	6.5	4.5	2	1.25	-	480	
			Std. Dev.	-	Log aver	102.42	10.72	19.02	31.2	34.84	13.94	7.93	4.51	5.45	4	2.5	-	480	
5	7012	211	Service Labourer	480	93	145	34	41	26	17	40	50	72	36	14	5	0	480	CC203
6*	4596	271	Service Labourer	480	111.1	10	13	18	23	5	17	16	143	39	21	22	153	480	CC203
7	4721	274	Service Labourer	480	88.2	62	23	10	11	44	243	36	47	4	0	0	0	480	CC203
8	4710	GSL	Gen. Lab. Serv.	480	85.2	251	16	13	16	19	50	80	34	1	0	0	0	480	2SSYA
9	4805	296	Labourer	480	85	197	32	37	23	79	50	16	36	10	0	0	0	480	SHAFI
10	4807	296	Labourer	480	80.8	177	58	54	54	63	27	36	7	4	0	0	0	480	SHAFI
11	4663	296	Labourer	480	81.6	58	58	49	50	184	62	15	3	1	0	0	0	480	SHAFI
12	4806	296	Labourer	480	80.1	251	55	44	33	24	27	36	7	3	0	0	0	480	SHAFI
13	4805	296	Mine Labourer	480	85.8	206	21	12	9	80	24	76	51	1	0	0	0	480	ISHAF
14	4800	MLA	Mine Labourer	480	84.2	140	16	11	13	65	192	37	6	0	0	0	0	480	2SSYA
15	4813	MLA	Mine Labourer	480	85	94	10	6	11	93	226	33	7	0	0	0	0	480	2SSYA
16	4682	242	Labourer	480	93.1	97	31	17	15	71	82	27	53	83	3	0	1	480	2SHAF
17	4803	296	Mine Labourer	480	89.8	110	17	30	25	36	92	83	68	19	0	0	0	480	CC210
18	4722	242	Labourer	480	87.5	274	26	18	10	45	49	17	8	22	10	1	0	480	28104
19*	4801	MLA	Labourer	480	96.3	156	70	56	35	23	15	23	29	21	21	29	2	480	32950
20	4808	296	Mine Labourer	480	77.1	297	61	40	25	21	19	5	8	4	0	0	0	480	00000
21	4800	296	Haulage	480	79.1	367	42	23	6	6	2	14	14	6	0	0	0	480	CC247
22*	4822	176	Scrapyard Lab.	480	98.7	82	30	21	18	14	9	54	64	122	65	1	0	480	00326
23	4748	176	Scrapyard Lab.	480	85.9	215	28	14	11	16	89	71	29	6	1	0	0	480	00326
24	4816	000	Labourer	480	79.3	144	70	117	62	31	21	24	11	0	0	0	0	480	SHAFI
25	4759	000	Labourer	480	81.6	99	69	92	100	70	14	14	18	4	0	0	0	480	SHAFI
			Mean	480	86.96 ▲	176.89	37.06	34.89	27.78	53.56	72.72	37.22	26.61	11.33	1.56	0.33	0.06	480	
			Std. Dev.	-	Log aver	86.87	19.79	29.66	24.43	41.89	73.08	24.86	22.92	20.24	3.93	1.19	0.24	480.01	

* Not estimated

Cont. overleaf

Table 1 - continued

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
26	4692	240	Construction Crew	480	80.3	181	53	65	61	62	30	17	6	5	0	0	0	480	ISHAF
27	4727	240	Construction Crew	480	82.4	251	36	20	21	41	53	37	20	1	0	0	0	480	ISHAF
28*	4135	240	Construction	380	80.6	341	31	25	11	14	19	22	17	0	0	0	0	480	36950
29	4213	240	Gen. Construction	480	85.3	138	55	35	50	59	59	44	31	9	0	0	0	480	31950
30	4281	240	Gen. Construction	480	79.1	327	26	21	23	18	19	37	8	1	0	0	0	480	36950
31	4123	GCS	Gen. Construction	480	93.9	95	59	76	64	72	58	13	7	8	7	14	7	480	95400
32	7474	GCS	Gen. Construction	480	91	150	36	25	28	55	77	40	30	19	16	4	0	480	00000
33	4166	240	Construction Serv	480	79.3	242	40	37	28	47	53	29	4	0	0	0	0	480	40954
34	7327	240	Construction Serv	480	82.0	184	42	40	25	58	81	42	8	0	0	0	0	480	40954
			Mean	480	87.65 ▲	196	43.38	39.88	37.5	51.5	53.75	32.38	14.25	5.38	2.88	2.25	0.88	480	
			Std. Dev.	-	Log aver:	74.02	11.31	20.5	17.85	16.45	21.05	11.66	11.12	6.57	5.84	4.95	2.47	480.01	
35	4820	240	U/G Construction	480	82.1	151	68	78	51	38	36	37	20	1	0	0	0	480	20951
36	4133	240	U/G Construction	480	81.5	192	73	73	44	10	34	30	22	2	0	0	0	480	24950
37	4241	240	U/G Construction	480	81.3	248	47	45	30	24	41	24	16	5	0	0	0	480	24950
38	2748	240	U/G Construction	480	91.3	119	21	19	43	92	43	29	64	41	9	0	0	480	26965
39	7774	240	U/G Construction	480	78.9	256	57	47	34	14	35	26	11	0	0	0	0	480	26965
40	2277	240	U/G Construction	480	84.7	124	21	26	35	150	57	32	34	1	0	0	0	480	32990
			Mean	480	85.56 ▲	181.67	47.83	48	39.50	54.67	41	29.67	27.83	8.33	1.5	-	-	480	
			Std. Dev.	-	Log aver:	60.37	22.65	23.92	7.82	55.41	8.6	4.59	19.31	16.1	3.67	-	-	480	
41	4820	240	Timberman	480	83.6	155	77	66	58	37	36	12	28	11	0	0	0	480	20951
42	4722	240	Timberman	480	86.2	109	23	26	45	84	81	72	39	1	0	0	0	480	39990
43	2277	240	Timberman	480	89.8	56	37	46	45	48	81	83	64	20	0	0	0	480	39990
44	4873	240	Timberman	480	80.7	235	51	40	39	36	27	35	17	0	0	0	0	480	26969
			Mean	480	86.33 ▲	138.75	47	44.5	46.75	51.25	56.25	50.5	37	8	-	-	-	480	
			Std. Dev.	-	Log aver:	75.85	23.04	16.6	8.02	22.5	28.81	32.87	20.12	9.42	-	-	-	480	
45	4659	TCA	Tool Crib Attd	480	86.3	90	54	51	76	81	62	27	20	16	3	0	0	480	00312
46	4547	296	Tool Crib Attd	480	72.4	275	67	51	39	36	9	2	1	0	0	0	0	480	00312
47	4524	140	#2 Tool Crib	480	76.8	120	68	98	88	71	29	5	1	0	0	0	0	480	00323
48	7006	291	Tool Crib Attd	480	71.3	318	55	26	40	23	17	1	0	0	0	0	0	480	2SHAF
			Mean	480	81.01 ▲	200.75	61	56.5	60.75	52.75	29.25	8.75	5.5	4.00	0.75	-	-	480	
			Std. Dev.	-	Log aver:	112.62	7.53	30.07	25.02	27.67	23.33	12.28	9.68	8.00	1.5	-	-	480	

* Not estimated

Cont. overleaf

Table 1 - continued

No.	User Code	Job Code	Operation	Time (min)	LOSHA (dBA)	Frequency Distribution (min/dBA) 60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119	Σ Time (min)	Note
49	0474	018	Mechanic	480	84.6	135	34	39	64	60	68	57	20	3	0	0	0	480	1SH05
50	4239	018	Mechanic	480	83.2	190	43	36	30	36	96	23	26	0	0	0	0	480	1SHA0
			Mean	480	83.96 ▲	162.5	38.5	37.5	47	48	82	40	23	1.5	-	-	-	480	
			Std. Dev.	-	Log aver.	38.89	6.36	2.12	24.04	16.97	19.8	24.04	4.24	2.12	-	-	-	480	
51	2839	080	Vent. Mtce.	480	93.8	71	16	12	18	9	58	162	81	43	9	1	0	480	CC203
52	4703	272	Vent. Mtce.	480	91.1	94	7	7	6	26	157	85	70	28	0	0	0	480	CC203
			Mean	480	92.66 ▲	82.5	11.5	9.5	12	17.5	107.50	123.5	75.5	35.5	4.5	0.5	-	480	
			Std. Dev.	-	Log aver.	16.26	6.36	3.54	8.49	12.02	70	54.45	7.78	10.61	6.36	0.71	-	480	
53	2979	220	Pipe Fitter	480	92.4	149	34	19	22	35	40	75	70	18	14	4	C	480	CC202
54	2506	220	Pipe Fitter	480	98.5	64	28	24	14	26	35	91	62	74	41	19	2	480	2SHAF
			Mean	480	96.44 ▲	106.5	31	21.50	18	30.5	37.5	83	66	46	27.5	11.5	1	480	
			Std. Dev.	480	Log aver.	60.1	4.24	3.54	5.66	6.36	3.54	11.31	5.66	39.6	19.09	10.61	1.41	480	
55	4140	141	Light Duty	480	86.8	134	34	36	30	27	96	92	21	10	0	0	0	480	2SHAF
56	7450	294	Respirator Attd.	480	66.3	377	38	33	23	5	4	0	0	0	0	0	0	480	1SHAF
57	7824	295	Sanitation	480	84.6	217	43	36	27	44	41	25	34	13	0	0	0	480	MINE0
			Mean	480	84.10 ▲	242.67	38.33	35	26.67	25.33	47	39	18.33	7.67	-	-	-	480	
			Std. Dev.	-	Log aver.	123.52	4.51	1.73	3.51	19.55	46.29	47.57	17.16	6.81	-	-	-	480	
58	0848	174	Fork Lift Op.	480	86.3	170	12	21	27	16	105	106	21	2	0	0	0	480	00322
59	4136	FRO	Fork Lift Op.	480	90.6	40	21	38	39	74	56	128	54	30	0	0	0	480	2SHAF
			Mean	480	88.96 ▲	105	16.5	29.5	33	45	80.5	117	37.5	16	-	-	-	480	
			Std. Dev.	-	Log aver.	91.92	6.36	12.02	8.49	41.01	34.65	15.56	23.33	19.8	-	-	-	480	
60	7689	253	Cage Tender	480	80.5	166	43	50	61	60	71	25	1	3	0	0	0	480	00302
61	0790	CTE	Cage Tender	480	84.7	85	30	48	64	106	87	39	15	5	1	0	0	480	00000
62	4412	253	Cage Tender	480	79.9	196	50	53	54	41	53	27	5	1	0	0	0	480	1SHAF
63	2829	CTE	Cage Tender	480	78.5	220	33	38	49	64	59	15	2	0	0	0	0	480	2SHAF
64	4709	253	Deckman	480	85.6	118	41	44	58	48	59	84	27	1	0	0	0	480	00303
65	7537	252	Loading Pocket	480	85	239	51	46	30	23	26	16	29	20	0	0	0	480	1SHAF
			Mean	480	83.21 ▲	170.67	41.33	46.5	52.67	57	59.17	34.33	13.17	5	0.17	-	-	480	
			Std. Dev.	-	Log aver.	59.8	8.59	5.21	12.29	28.11	20.26	25.84	12.53	7.56	0.41	-	-	480.01	
66	2505	101	Hoistman	457	80.1	132	54	56	26	140	62	9	1	0	0	0	0	480	SKIP2
67	0536	100	Hoistman	470	82.5	73	28	52	31	201	62	30	3	0	0	0	0	480	SH20T
68	4304	100	Hoistman	480	78	189	64	49	36	95	25	22	0	0	0	0	0	480	1SHA0
			Mean	469	80.58 ▲	131.33	48.67	52.33	31	145.33	49.67	20.33	1.33	-	-	-	-	480	
			Std. Dev.	11.53	Log aver.	58	18.58	3.51	5	53.2	21.36	10.6	1.53	-	-	-	-	479.99	

APPENDIX A

MEASUREMENT OF NOISE EXPOSURE INDEX OF UNDERGROUND SERVICE MINE WORKERS WITH FULL INFORMATION: PERCENT DOSE (CURRENT AND CUMULATIVE): ARITHMETIC MEAN: STANDARD DEVIATION: VARIANCE: AMPLITUDE DISTRIBUTION (GRAPHICAL AND NUMERICAL): AND TIME HISTORY (GRAPHICAL).

(1)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1221    60    64     4     1
       65      115200  480
  60  60  60  64  60  68  60  69  65  64  63  60  60  62  64  64
  60  60  61  69  69  69  61  69  85  90  77  66  80  74  72  68
  62  64  79  65  69  87  73  65  69  66  83  73  68  71  74  77
  84  86  89  97  95  92  90  89  83  75  64  65  64  61  61  60
  60  60  60  64  61  60  60  60  66  60  60  60  64  63  63  66
  60  63  72  77  76  84  75  82  80  74  78  76  73  73  79  75
  73  78  78  71  73  76  73  82  81  78  78  75  79  77  74  78
  74  74  77  70  75  74  75  74  70  74  72  73  73  74  81  74
  69  71  60  60  73  66  75  67  65  60  71  65  71  74  69  72
  78  78  81  80  74  82  73  77  73  75  73  76  75  74  74  74
  79  73  68  62  61  64  61  66  66  65  60  62  68  71  70  68
  77  77  75  73  79  77  81  73  77  72  79  71  79  66  74  83
  72  79  77  84  75  82  81  80  82  81  79  76  65  86  73  77
  78  77  81  79  75  79  73  74  68  83  84  84  79  80  81  85
  83  87  79  62  65  60  63  61  60  76  77 100  85  77  79  75
  77  77  75  73  69  60  73  76  89  85  81  81  78  82  79  76
  81  75  76  74  74  80  72  72  62  60  82  60  60  60  60  60
  60  60  60  60  60  60  60  65  60  60  60  62  60  60  60  60
  60  65  62  60  67  78  76  72  73  72  81  73  76  74  68  73
  79  84  80  66  79  80  79  77  82  60  61  66  72  60  60  61
  68  62  76  71  69  65  69  72  60  61  60  70  68  62  60  60
  61  60  64  61  62  60  73  60  79  80  80  79  80  79  80  80
  83  82  82  81  82  83  87  85  83 102  85  81  82  78  79  75
  71  80  75  84  86  80  76  82  83  82  85  92  87  84  95  83
  94  83  86  84  85  84  86  86  85  83  85  83  84  84  84  83
  83  83  83  83  88  82  83  82  82  85  83  84  84  83  81  82
  86  79  86  90  88  90  94  94 101  94  93  90  90  79  72  90
  92  97  96  92  93  84  82  81  66  74  62  73  66  79  61  79
  72  80  83  77  73  65  63  90  88  90 101  99  98  70  60  89
 101 104 104 104  97  77  95 102  81  60  60  60  72  99 102 103
stop
```

(1)

```
ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : SHAFT
ENTER USER CODE (4 CHARS) : 4516
 ENTER JOB CODE (3 CHARS) : 241
```

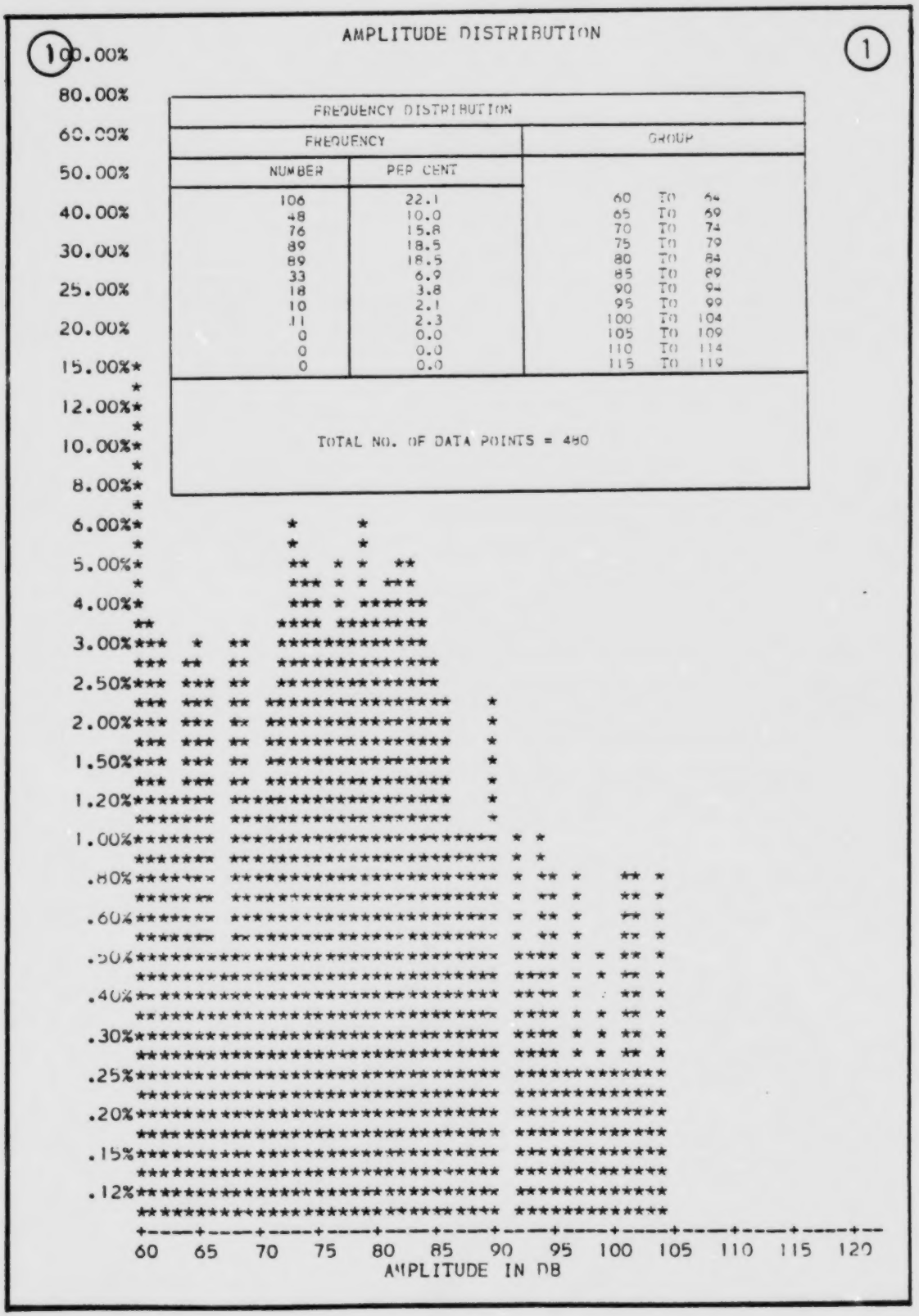
```
   DATA LOGGED :31 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DS-301/26                 SITE CODE : SHAFT
SERIAL NUMBER : 1221                       JOB CODE : 241
     BASELINE : 40 DB                     USER CODE : 4516
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:16
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGIA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	80.3	80.3	3.253	3.25
2	74.6	78.0	1.475	4.73
3	76.1	77.7	1.199	5.93
4	80.7	77.9	3.443	9.37
5	74.2	77.3	1.402	10.77
6	76.1	77.1	1.826	12.60
7	69.7	76.2	0.694	13.45
8	93.2	83.2	19.570	33.02

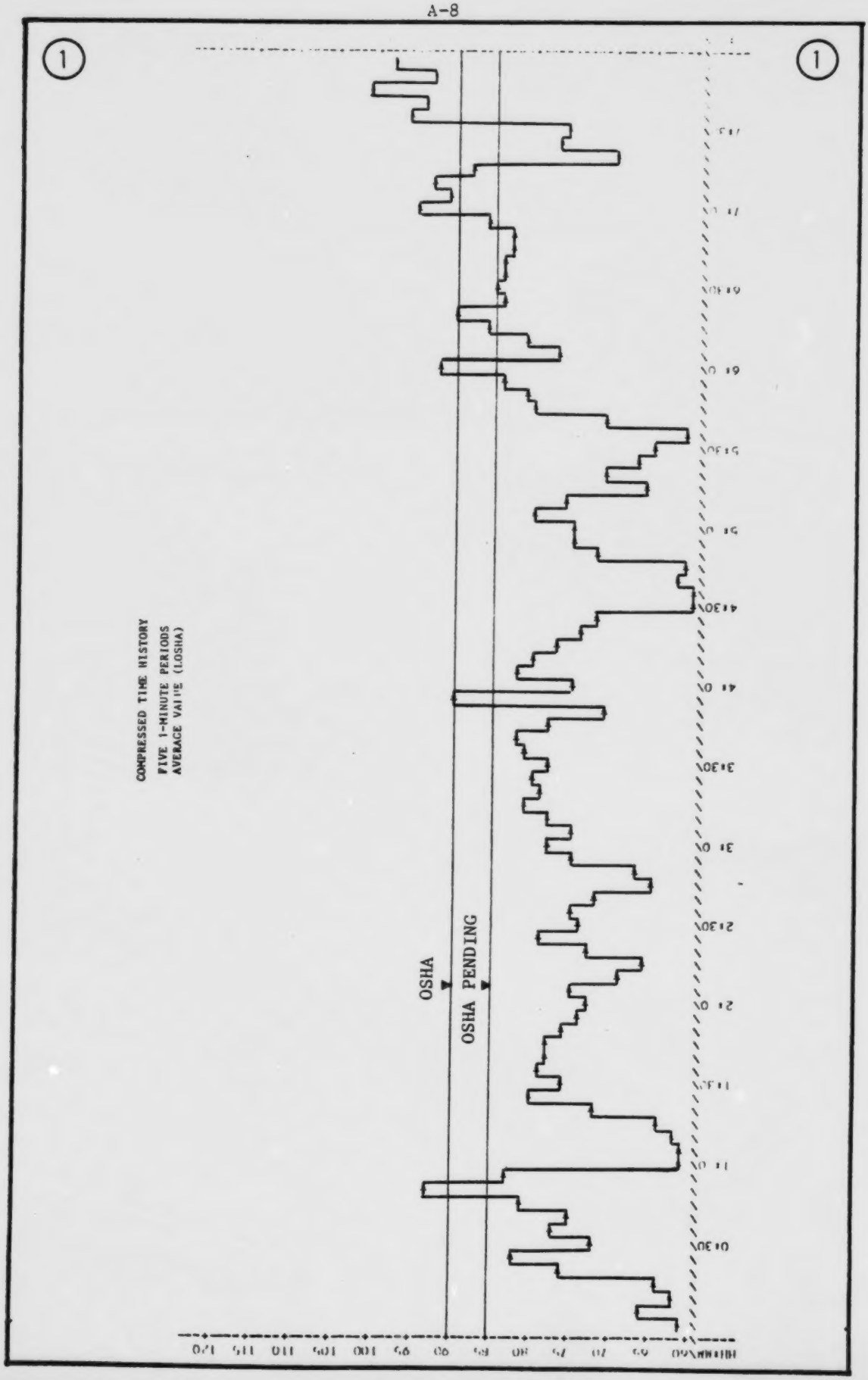
```
MIN. COMP. =  60 DB              MAX. COMP. = 104 DB
ARITHMETIC MEAN =  74 DB
STD. DEVIATION =  10 DB
VARIANCE = 100 DB
```



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
106	22.1	60 TO 64
48	10.0	65 TO 69
76	15.8	70 TO 74
89	18.5	75 TO 79
89	18.5	80 TO 84
33	6.9	85 TO 89
18	3.8	90 TO 94
10	2.1	95 TO 99
11	2.3	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dB(A)
60
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(2)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1220    60   64    4    1
     126     115200  480
 60  60  60  60  62  68  68  64  65  60  60  60  66  65  62  66
 61  71  61  64  75  68  72  71  91  90  82  79  76  66  64  60
 69  71  61  76  86  67  63  70  66  82  71  67  77  71  78  81
 78  62  75  85  73  66  71  60  60  63  64  61  60  61  61  60
 63  87  61  71  69  72  72  73  65  70  71  70  66  82  90  89
 87  61  67  75  81  71  71  75  79  70  74  64  62  78  89  98
 67  76  69  67  74  69  68  62  65  66  68  61  62  60  60  60
 64  61  60  69  69  66  60  73  62  64  68  63  65  60  61  61
 69  65  84  66  83  92  61  60  60  63  60  60  62  64  68  60
 62  60  64  66  64  60  63  60  60  62  67  60  60  61  66  61
 64  66  68  62  75  75  67  66  65  60  62  76  63  69  67  72
 69  64  70  65  62  63  61  61  63  64  66  62  68  64  65  65
 60  60  67  65  76  65  69  80  71  66  70  62  60  60  60  60
 73  60  60  68  60  60  60  65  63  60  79  71  61  61  60  60
 60  60  60  60  73  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  69  66  60  63  64  62  60  60  60  60
 75  74  60  71  71  80  84  83  81  60  60  60  60  80  75  64
 70  73  62  65  65  76  72  62  78  72  60  77  76  76  61  64
 60  60  60  61  60  60  60  60  60  60  75  67  61  61  61  60
 62  79  60  64  60  60  60  60  62  60  60  69  61  60  64  65
 85  69  66  60  60  60  60  60  60  60  62  60  62  64  60  63
 65  60  60  67  61  79  64  60  60  60  66  64  60  62  60  61
 60  60  60  60  60  60  60  60  63  60  60  60  60  61  60  60
 60  62  60  60  60  60  60  60  60  60  60  60  60  65  90  74
 60  62  60  60  60  60  60  60  60  60  60  60  60  60  61  74
 87  81  60  60  60  60  79  67  67  60  60  60  60  62  60  63
 60  60  60  60  61  60  60  74  84  87 101 106  97  97  85  85
 85  86  84  84  89 101 101  73  62  75  88  99  94 100 103  97
 82  76  61  69  69  68  73  91 103 106 106  86  60  89 103 105
109 108 106  62  97 110  97  60  60  60  60 106 110 110 110 110
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 31/07/79

ENTER SITE CODE (5 CHARS) : SHAFT
ENTER USER CODE (4 CHARS) : 4416
 ENTER JOB CODE (3 CHARS) : 241
```

```
   DATA LOGGED :31 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : SHAFT
SERIAL NUMBER : 1220                        JOB CODE : 241
      BASELINE : 60 DB                     USER CODE : 4416
DYNAMIC RANGE : 64 DB                     THRESHOLD :  60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:31
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL LOG [80 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	74.9	74.9	1.538	1.54
2	79.1	77.3	2.765	4.30
3	72.3	76.0	1.069	5.37
4	67.0	74.6	.512	5.88
5	71.9	74.1	1.012	6.90
6	66.9	73.3	.512	7.41
7	69.1	72.8	.693	8.10
8	99.5	85.7	46.683	54.78

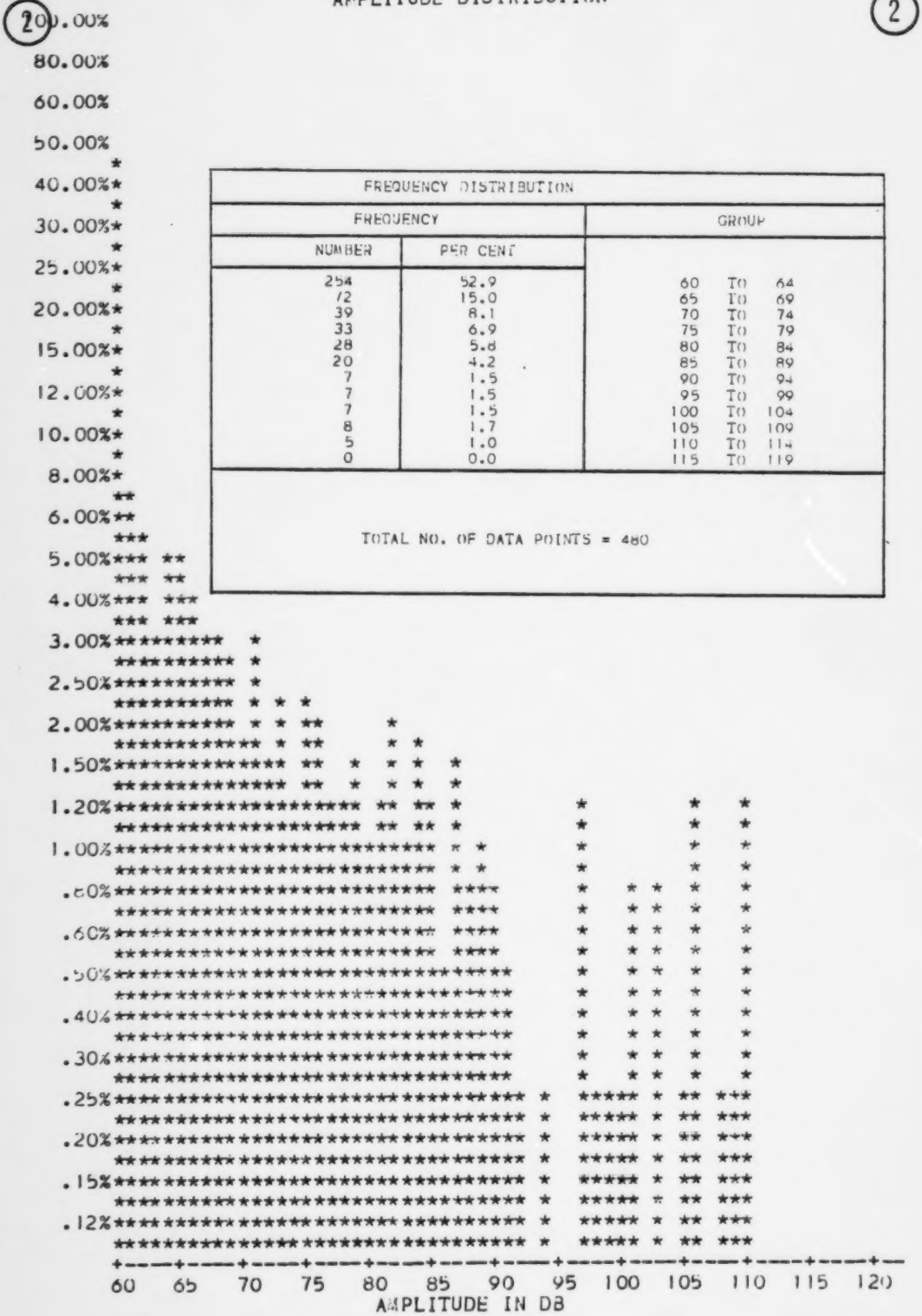
MIN. COMP. = 60 DB MAX. COMP. = 110 DB
ARITHMETIC MEAN = 68 DB
STD. DEVIATION = 12.78
VARIANCE =144 DB

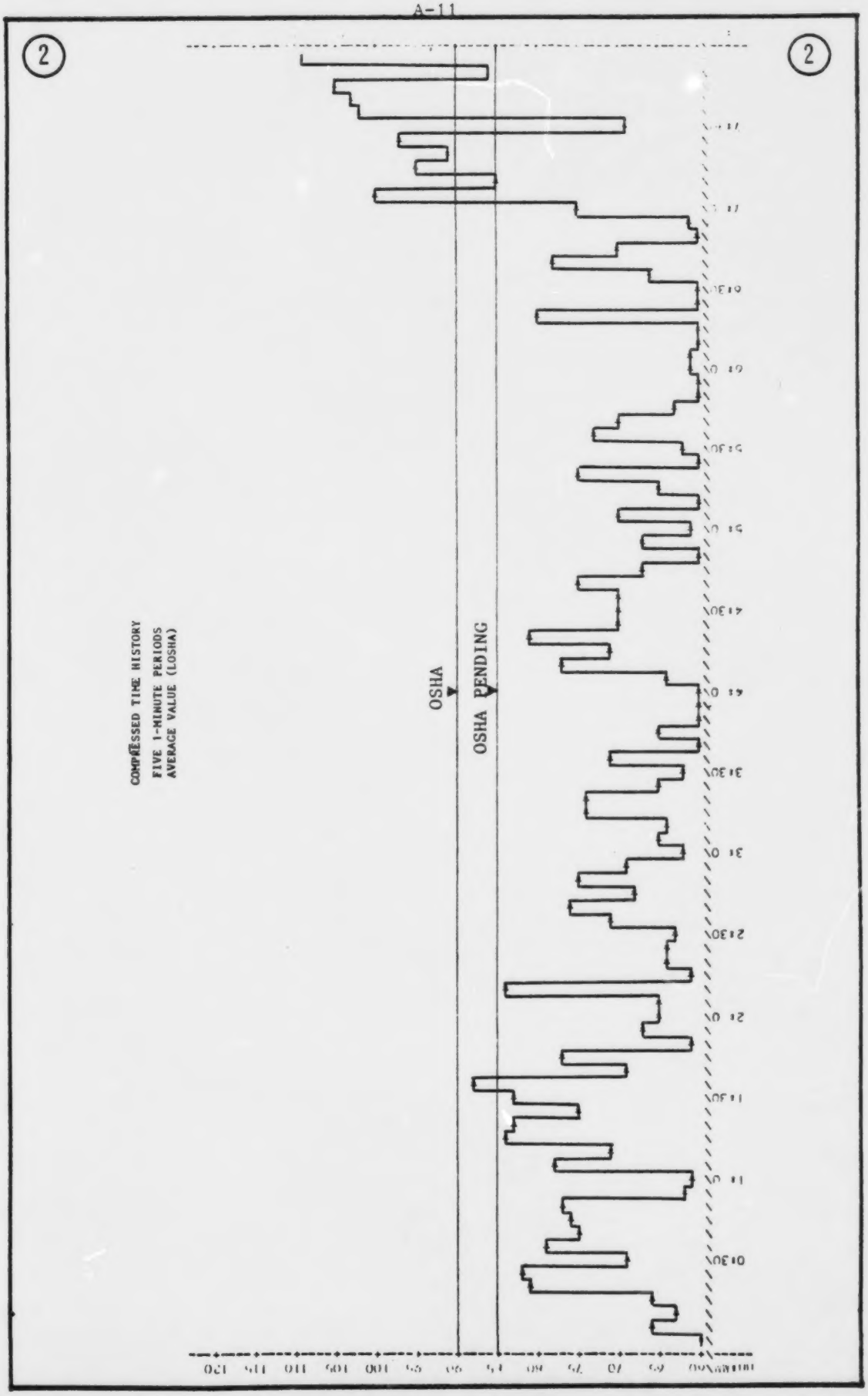
AMPLITUDE DISTRIBUTION

(2) (2)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
254	52.9	60 TO 64
72	15.0	65 TO 69
39	8.1	70 TO 74
33	6.9	75 TO 79
28	5.8	80 TO 84
20	4.2	85 TO 89
7	1.5	90 TO 94
7	1.5	95 TO 99
7	1.5	100 TO 104
8	1.7	105 TO 109
5	1.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




2
2
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
21:30
31:30
41:30
51:30
61:30
71:30
120
115
110
105
100
95
90
85
80
75
70
65
DBA/90

(3)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(3)

```
 1  26  80  1213    60    64     4     1
      76      115200   480
 60  72  63  66  61  60  60  77  73  60  64  62  70  70  70  73
 68  67  77  76  71  60  61  64  60  61  60  67  65  61  60  63
 61  67  64  66  65  60  77  60  62  63  66  75  70  78  80  80
 79  81  82  72  63  67  60  60  61  60  60  60  61  60  60  63
 62  60  61  60  60  64  62  60  60  60  60  60  60  81  62  60
 60  65  65  60  60  61  60  60  74  69  61  68  64  67  67  75
 68  73  72  69  62  60  67  62  60  60  60  64  62  60  60  60
 65  60  60  61  61  63  63  60  60  67  60  60  60  60  60  60
 60  60  61  60  60  62  60  63  64  60  62  70  62  60  65  60
 60  62  72  74  77  63  65  64  60  60  60  60  60  68  69  62
 61  60  60  62  64  64  65  70  70  67  81  71  67  76  62  72
 73  60  60  61  62  60  62  60  60  60  60  60  63  60  60  61
 60  60  60  67  64  62  65  62  64  61  61  72  63  64  60  64
 61  60  74  60  60  68  60  65  80  74  79  69  60  65  60  64
 61  66  60  60  60  60  61  72  62  60  61  68  61  60  60  64
 60  60  66  61  60  60  60  60  60  60  60  71  60  60  60  67
 74  67  76  73  60  60  60  60  60  68  64  64  60  68  60  60
 62  60  60  60  61  60  60  64  62  60  60  60  60  60  60  65
 77  65  66  76  60  60  60  60  60  63  66  60  60  60  64  60
 60  60  65  60  82  60  60  66  63  62  60  60  60  60  61  60
 61  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  78  63  60  61  62  68  68  63  60  60  67  60  60  60
 60  62  64  60  60  60  60  61  61  60  60  68  60  60  66  62
 63  60  60  62  72  61  60  63  60  60  60  60  60  60  60  60
 60  61  60  60  62  60  60  60  60  60  60  60  61  60  60  60
 62  60  60  60  60  60  60  60  60  60  60  62  60  68  65  60
 60  60  65  66  60  61  60  60  60  67  75  68  60  61  62  64
 74  60  62  71  60  60  64  61  60  61  65  71  60  66  69  66
 60  61  65  60  61  60  65  61  60  60  62  60  60  60  65  73
 60  60  65  62  60  60  60  60  63  61  71  67  60  60  62  69
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : GENSE
ENTER USER CODE (4 CHARS) : 4133
 ENTER JOB CODE (3 CHARS) : SMA
```

```
   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : GENSE
SERIAL NUMBER : 1213                      JOB CODE : SMA
      BASELINE : 60 DB                    USER CODE : 4133
 DYNAMIC RANGE : 64 DB                    THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC             TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0           STANDBY TIME =   0: 0:19
```

TIME HISTORY ANALYSIS

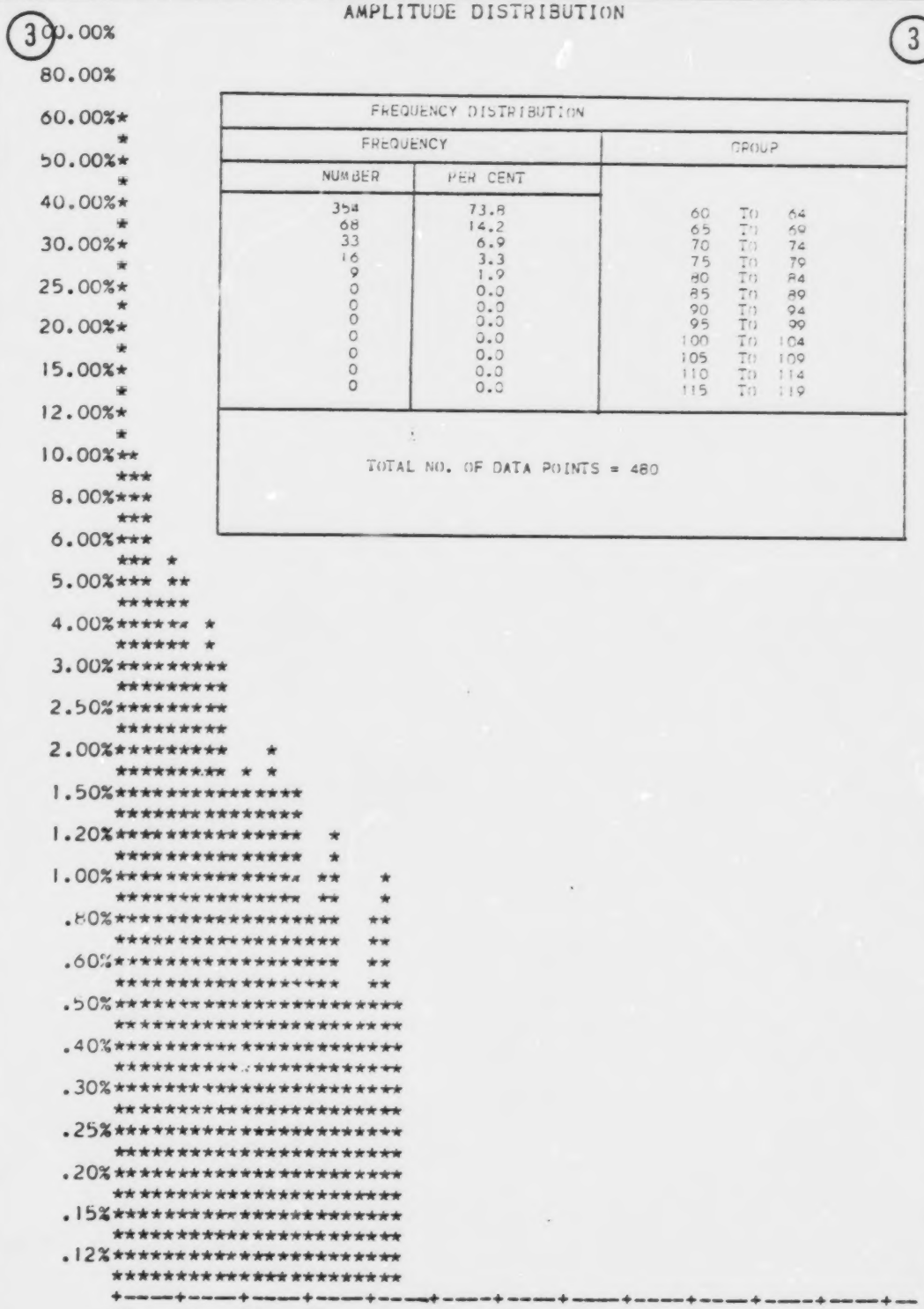
```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	70.3	70.3	.814	.81
2	65.2	68.2	.401	1.21
3	66.4	67.6	.477	1.69
4	66.4	67.4	.477	2.17
5	64.8	66.9	.382	2.55
6	63.9	66.5	.336	2.89
7	61.7	66.0	.248	3.13
8	64.5	65.8	.363	3.50

```
MIN. COMP. =  60 DB                MAX. COMP. =  82 DB
ARITHMETIC MEAN =  63 DB
STD. DEVIATION =  5 DB
VARIANCE = 25 DB
```

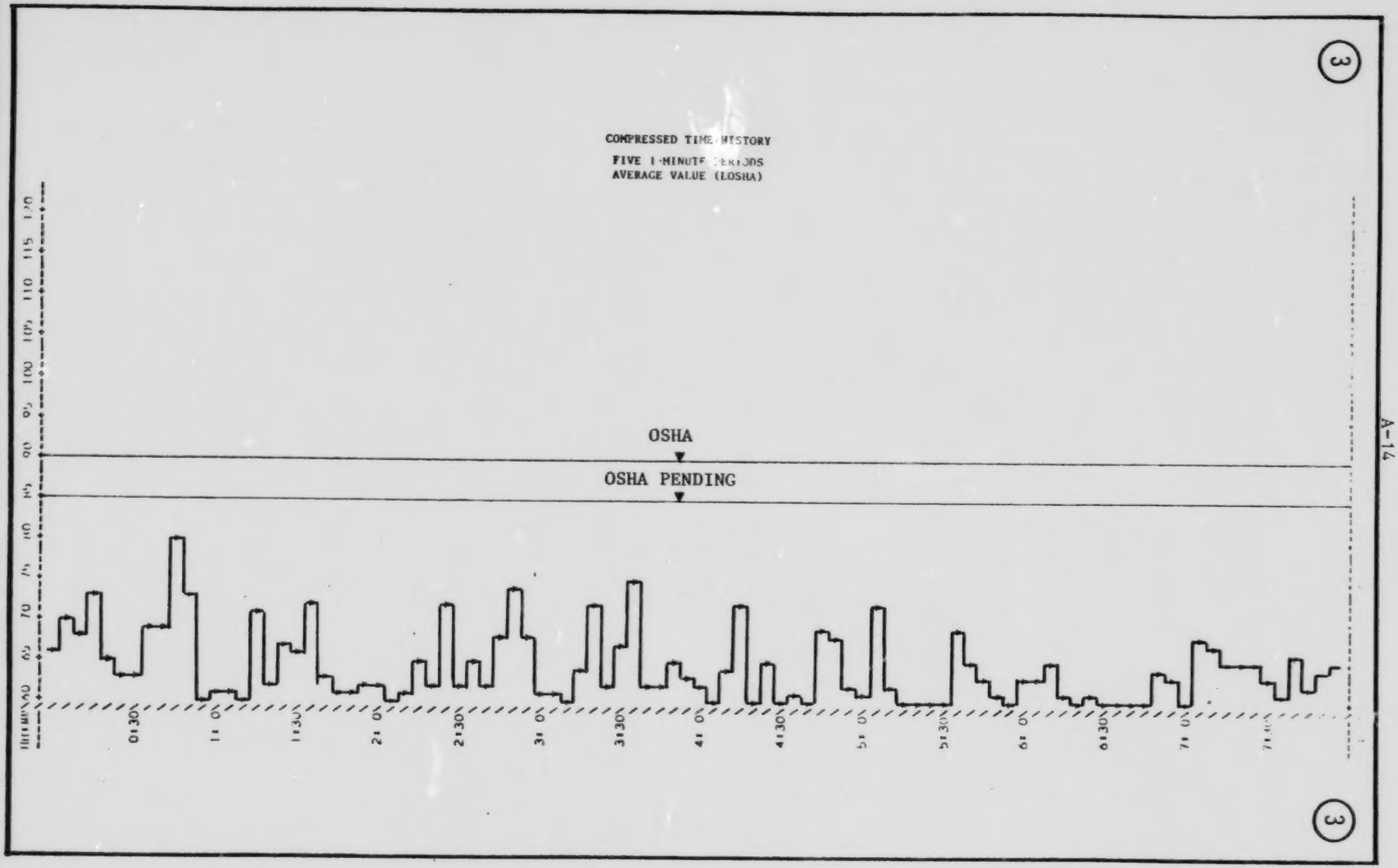
AMPLITUDE DISTRIBUTION

(3) (3)



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
354	73.8	60 TO 64
68	14.2	65 TO 69
33	6.9	70 TO 74
16	3.3	75 TO 79
9	1.9	80 TO 84
0	0.0	85 TO 89
0	0.0	90 TO 94
0	0.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


3
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
3

(4)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1219    60    64     4     1
      42      115200   480
  61  62  60  60  63  64  69  60  66  69  61  63  61  64  60  61
  68  65  66  72  63  77  83  90  61  60  60  65  60  60  60  64
  71  60  76  84  63  61  60  66  78  61  60  74  65  77  85  90
  92  98  94  90  89  89  83  60  60  62  62  60  60  69  65  64
  71  61  60  71  60  60  62  60  63  60  60  60  65  63  61  68
  68  77  83  75  82  72  72  70  70  76  71  66  63  75  74  75
  81  77  79  80  81  82  81  81  79  80  78  78  80  78  79  79
  80  79  80  80  80  79  79  80  81  80  80  80  80  80  80  80
  80  81  80  82  81  80  80  80  80  79  78  76  75  70  76  81
  74  78  76  78  72  68  76  66  68  64  64  71  66  65  66  60
  60  60  60  60  60  60  63  62  60  65  64  63  62  64  72  67
  73  72  67  71  72  72  75  74  66  76  73  61  63  75  71  71
  69  67  64  63  65  75  66  69  63  60  67  70  64  63  66  64
  69  68  63  69  63  61  69  74  74  72  68  67  68  60  66  77
  60  60  60  60  60  60  60  80  84  97  60  66  70  60  67  68
  63  68  60  71  71  70  77  65  69  67  68  78  69  72  63  63
  66  60  62  65  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  63  60  60  60  60  60  60  60  60  60
  60  60  78  68  60  60  68  60  62  62  60  61  63  64  70  72
  60  60  62  70  71  77  60  60  60  72  60  60  60  63  61  66
  69  64  65  68  60  72  61  60  60  68  63  60  60  60  60  61
  60  60  60  60  69  60  61  62  60  60  60  63  61  60  62  61
  60  60  60  70  71  61  84  89  61  65  61  62  60  60  75  60
  62  65  61  63  61  65  70  60  74  84  60  62  83  63  60  63
  60  61  64  63  66  61  62  61  61  60  61  60  61  60  60  60
  60  71  76  60  69  60  60  64  60  62  61  60  60  61  64  77
  91  91  90  94  95  99  96  96  83  88  91  66  87  94  94  95
  96  95  65  73  80  60  74  61  66  74  63  76  60  82  80  75
  70  60  60  61  80  85  85  89  90  90  85  85  85  86  85  84  82
  84  83  83  83  85  84  85  86  89  86  87  87  87  88  86  76
%EOF
```

(4)

```
ENTER LOG DATE (DD/MM/YR) : 31/07
ENTER)IT9
ENTER USER CODE (4 CHARS) : 4805

 ENTER JOB CODE (3 CHARS) : 296
```

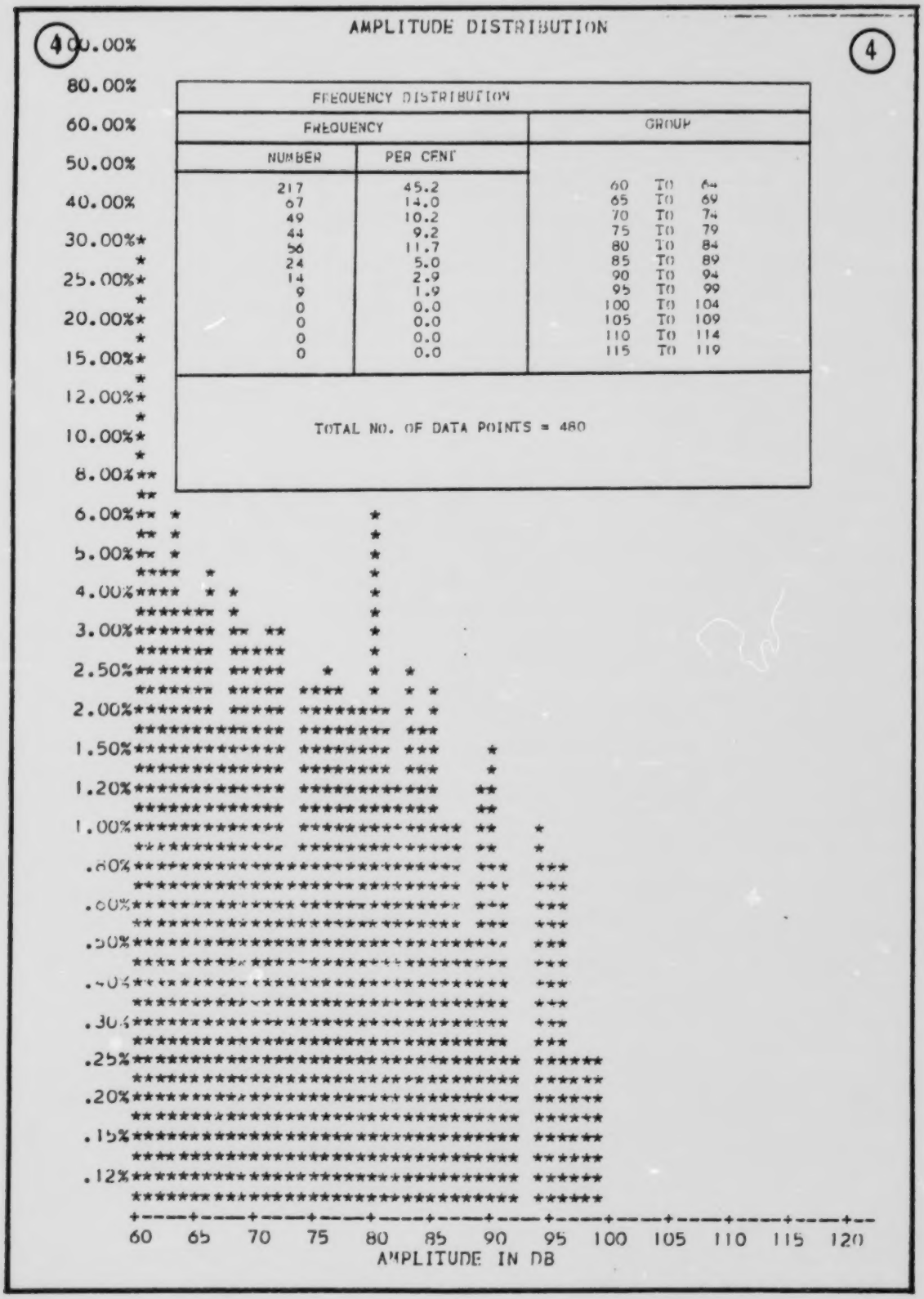
```
   DATA LOGGED :31 JULY 1900          DATA ANALYZED : 24 SEPT 1979
      LOGGER : DB-301/26                  SITE CODE : 79
SERIAL NUMBER : 1219                      JOB CODE : 241
    BASELINE : 60 DB                     USER CODE : 4180
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8 HR 0 M            STANDBY TIME =   0 HR 0 M
```

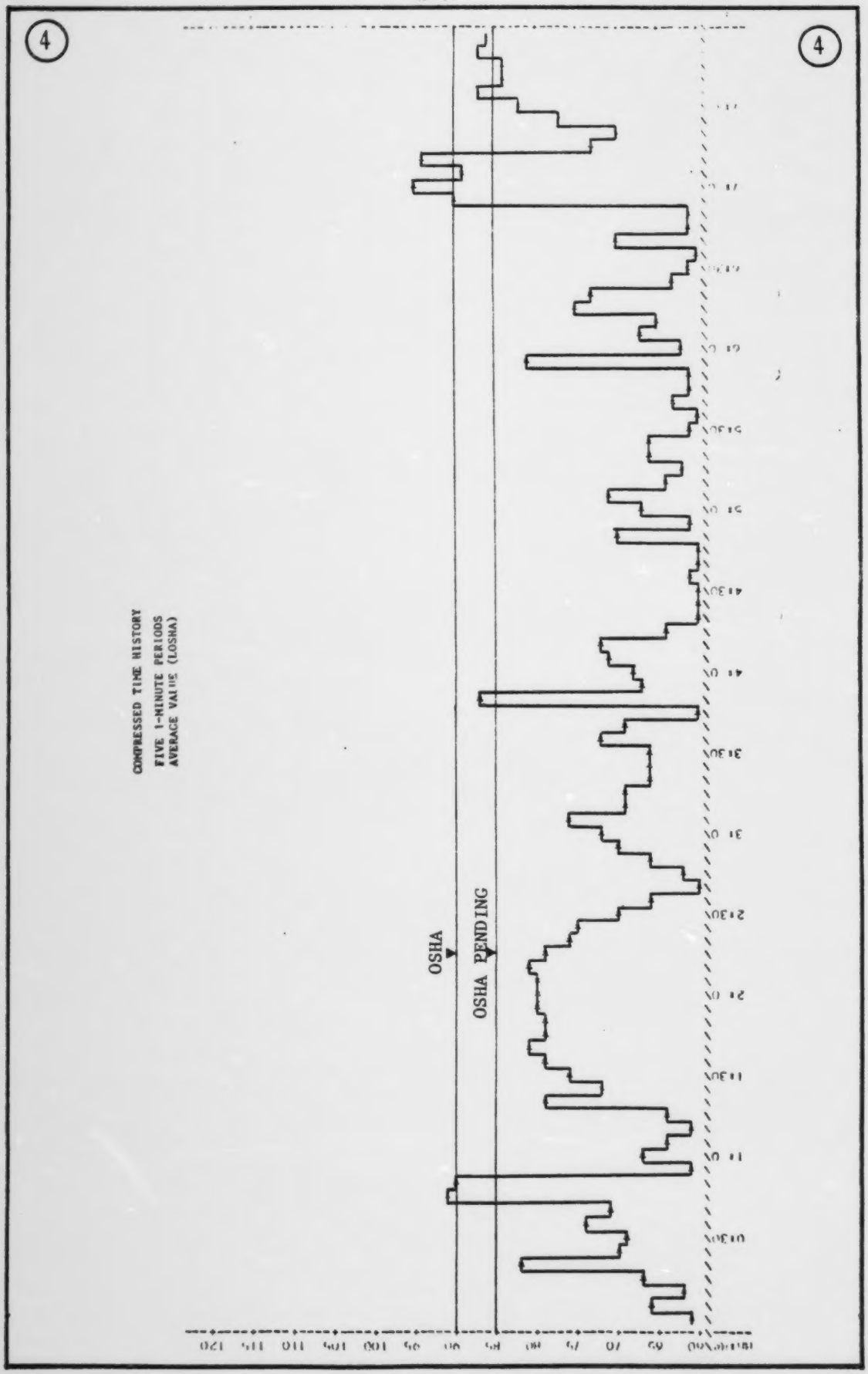
TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	79.8	79.8	3.051	3.05
2	76.0	78.2	1.797	4.85
3	75.9	77.3	1.570	6.42
4	74.0	76.6	1.369	7.79
5	65.4	75.3	.415	8.20
6	68.6	74.6	.541	8.74
7	75.0	74.6	1.564	10.31
8	67.1	74.0	8.419	18.72

```
MIN. COMP. =  60 DB                MAX. COMP. =  99 DB
ARITHMETIC MEAN =  80 DB
STD. DEVIATION =  10 DB
VARIANCE = 101.79
```


AMPLITUDE DISTRIBUTION
4
4
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
217 45.2 60 TO 64
67 14.0 65 TO 69
49 10.2 70 TO 74
44 9.2 75 TO 79
56 11.7 80 TO 84
24 5.0 85 TO 89
14 2.9 90 TO 94
9 1.9 95 TO 99
0 0.0 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


4
4
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
01:30
1
1:30
2
2:30
3
3:30
4
4:30
5
5:30

(5)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
   1  26  80  1216   60   64    4    1
      392     1152 0  480
  64  60  68  62  60  64  71  67  71  72  72  67  68  69  72  71
  61  64  62  71  74  76  64  63  61  60  60  63  60  60  61  62
  71  74  75  70  72  73  78  89  94  99  99  98  99  98  96  91
  97  81  74  73  64  73  64  67  68  69  66  70  68  70  72  75
  73  73  67  70  71  72  59  62  62  62  67  73  69  61  61  61
  63  64  --  --  74  71  --  --  --  --  --  --  --  --  --  --
  --  101 101 103 101 --  --  --  --  --  --  --  --  --  --  --
 100 100 100  91  96  --  101 101 104 105 102 --  --  --  --  --
 102 100  --  97  93  92  94  93  97  98  98  90  --  --  94  85
  81  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
  97  89  87  88  83  70  82  75  --  --  80  73  --  60  77  82
  --  73  60  --  --  --  --  --  97 100 97  93  --  --  --  85
  --  --  --  --  71  67  --  --  --  77  --  --  --  --  --  --
 101 102 108 108 107 107 105 105 102 100  98  99  97  91  86  86
  86  85  95  98  94  70  84  61  66  65  60  77  71  73  83  88
  95 101  93  97 101 110 110 110 102 100 100  89  --  --  --  --
  91  97  97  95  79  60  60  60  60  60  60  61  60  60  60  60
  60  61  63  63  60  61  60  63  60  60  60  60  61  62  60  60
  60  60  60  60  60  60  60  60  60  60  64  62  60  63  60  60
  67  76  81  76  60  60  70  60  68  74  60  69  71  60  89  96
  95 100  88  93 104 101 104 108 108 100 100 104  --  --  --  --
 111 111  94  97  93  94  90  92  94  89  91  96  99  96 100  87
  87  94  99 100 106  93  93  95 101 100  99  98  97  95  93 100
 101  99  85  70  61  72  89  89  89  89  90  90  90  89  90  90
  90  91  95  94  94  92  96  97  92  92  97  90  79  75  79  78
  68  63  78  69  74  74  67  67  74  60  60  63  60  61  60  64
  71  71  76  76  86  83  81  81  84  85  78  85  71  81  77  82
  84  74  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  65  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
EOF
```

(5)

```
ENTER LOG DATE (DD/MM/YR) : 20/07/79
ENTER SITE CODE (5 CHARS) : 00203
ENTER USER CODE (4 CHARS) : 7012

 ENTER JOB CODE (3 CHARS) : 211
```

```
    DATA LOGGED :20 JULY 1979
         LOGGED : 11-30/25                DATA ANALYZED : 14 SEPT 1979
  SERIAL NUMBER : 1216                        SITE CODE : 00203
       SAMPLING : 60 DB                       JOB CODE : 211
  DYNAMIC RANGE : 64 DB                       USER CODE : 7012
  AT PEAK TAPE : 4/SEC                     THRESHOLD : 60 DB
  TEST DURATION = 31 MIN 20 SEC            TOTAL SAMPLES = 1152000
                                           START AT : 0 : 1:2
```

TIME HISTORY ANALYSIS

```
...IS: BACKGROUND I  ...A (S.P.I.) CALCULATIONS
ARE BASED ON THE FOLL...ING
I... = ... / ...
CALC... ( ...II ) ... = ...
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 ...UTES
```

...I S	10 ...		...	
ROOM	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	89.3	89.3	0.554	6.56
2	...2	...6	17.712	23.87
3	...9	91.6	23....	...8
4	93.9	92.2	2...162	79.21
5	94.3	93.2	32.620	97.33
6	7.0	93.3	37....	135.79
7	90.0	93.0	13.65...	1...49
8	12.4	93.0	1.045	150.53

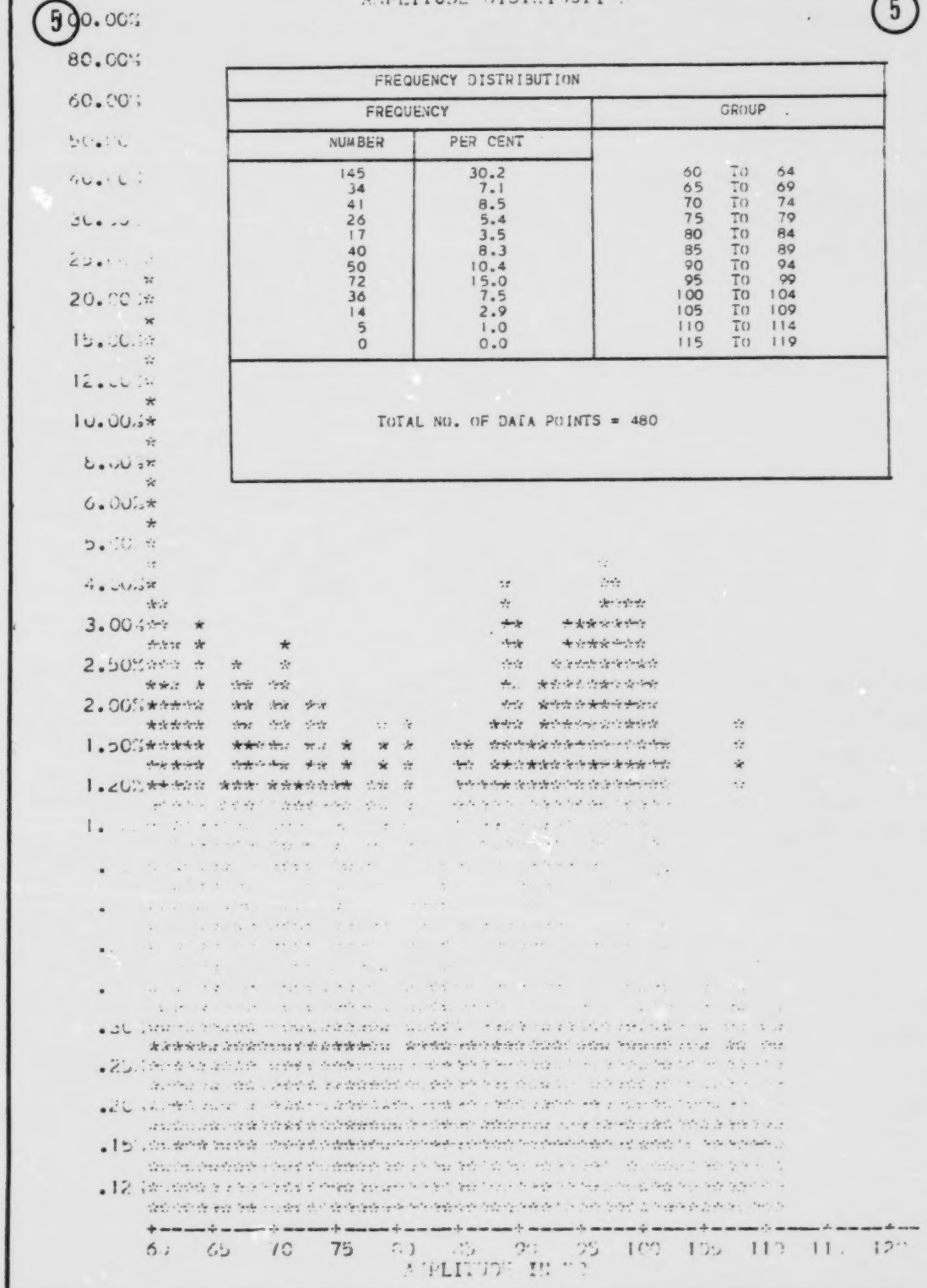
...IN. COMP. = 60 DB MAX. COMP. = 111 DB
ALL...SAMPLES ... = 79 DB
ST... ...VIATION = 13 ...
VARIANCE =...

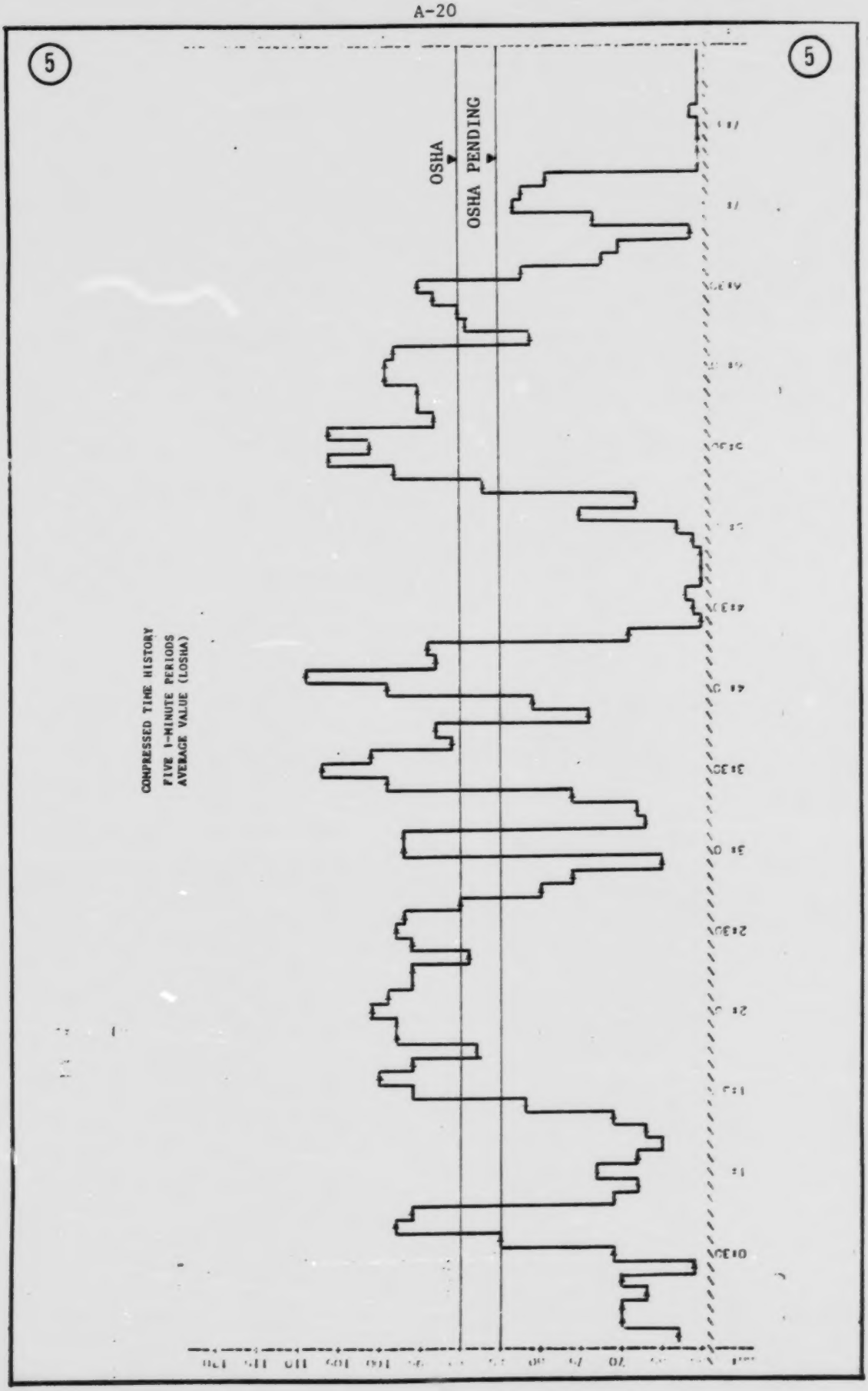
AMPLITUDE DISTRIBUTION

(5) (5)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
145	30.2	60 TO 64
34	7.1	65 TO 69
41	8.5	70 TO 74
26	5.4	75 TO 79
17	3.5	80 TO 84
40	8.3	85 TO 89
50	10.4	90 TO 94
72	15.0	95 TO 99
36	7.5	100 TO 104
14	2.9	105 TO 109
5	1.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




5
5
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(6)

```
PLACE TAPE IN READER UNIT, THEN PRESS RUN
  1  25  80  121   60   64    8    1
    262     1152 90  440
  75  79  76  65  79  78  76  76  74  76  77  76  62  61  70  75
  77  80  65  68  77  76  78  74  73  70  71  79  73  79  66  90
  92  96 107 100 100 101 101  95 101 101  88  84  79  68  72  67
  61  62  61  61  67  74  73  63  65  73  67 100  71  90  67  69
  92  95  96  95 102 116 119 116 117 118 116 119 119 117 113 116
   .  114 114 114 114 117 116 117 115 119 114 116 117 113 117 118
 117 113   .  106   .  95    .   .   .   .   .   .   .   .   .   .
   .   .  103  98  93  92  91  92  91  91  91  91  91  91  92 100 101
 100 105  93 103 102 102  97 100 101 101 101 102  1  116 112   .
  95  92  97  99  99  99  99  98  99 102 107 105  98  96  96  96
  98 102  96  96   .   .  101 101 101   .   .   .   .   .  99  99
  99  99  99  99  99  99  96  97  96  97  97  97  97  97  97 110
 103 100  99  96  93  91  93  96  99  99  99 110 110 112 119 119
 112 114 111 112 114 111  111   .  117 111 113 114 113 113 114 111
 119 117 115 108 114  95 114 116 119 119 116 117 116 115 116  .
  99  97  97  97  98 116 104  99  99  99 113 116 118 116  97  97
  97  97  96  96  93  97  97  96   .   .   .  95  97  97  97  97
  97  97  97  97  97  97  97  97  97  97  97  97  97  97  97  97
  97  97  97  97  97  97  97  97  97  96  97  97  96  96 108 118
 116 118 113 116 116 114  99 100  99 114 117 116 118 116 114 112
 112 111  111 117 117 117 117 116 115 114 112  97  97  96  96  96
  96  96  96  96  96  97  96  97  97  97  97 112 111 111 111  .
 117 118 113 118 113 117 118 115 113 118 118 116 116 119 116 116
 118 117 115 119 119 112 118 116 113 119 112 117 117 119 118 118
 118 118 119 119 119 119 119 117 116 117 116 116 117 119 119 119
 119 116 117 116 116 117 117 117 118 118 118 11  118 116 116 116
 104 105 101 108 112 111 117 116 104 105 105 105 105 112 114 119
 117 117 120 122 120 119 119 117 114 115 114 114 119 101  .   .
  71  68  73  73  64  63  60  70  70  53  72  69  65  68  75  71
  75  76  63  68  70  65  72  80  90  69  90  89  69  90  91  89
$EOF
```

(6)

ENTER LOG DATE (DD/MM/YR) : 20/07/79
ENTER SITE CODE (5 CHARS) : CC203

ENTER USER CODE (4 CHARS) : 4596

ENTER JOB CODE (3 CHARS) : 271

DATA LOGGED :20 JULY 1979
LOG [illegible] : -3 1/2%
[illegible] : 1213
[illegible] : 6 3
[illegible] : 4 1
[illegible] : 7/2%
[illegible] = 4 :

DATA ANALYZED : 14 SEPT 1979
[illegible] :
[illegible] : 271
[illegible] :
[illegible] :
[illegible] =
[illegible] = 4 1

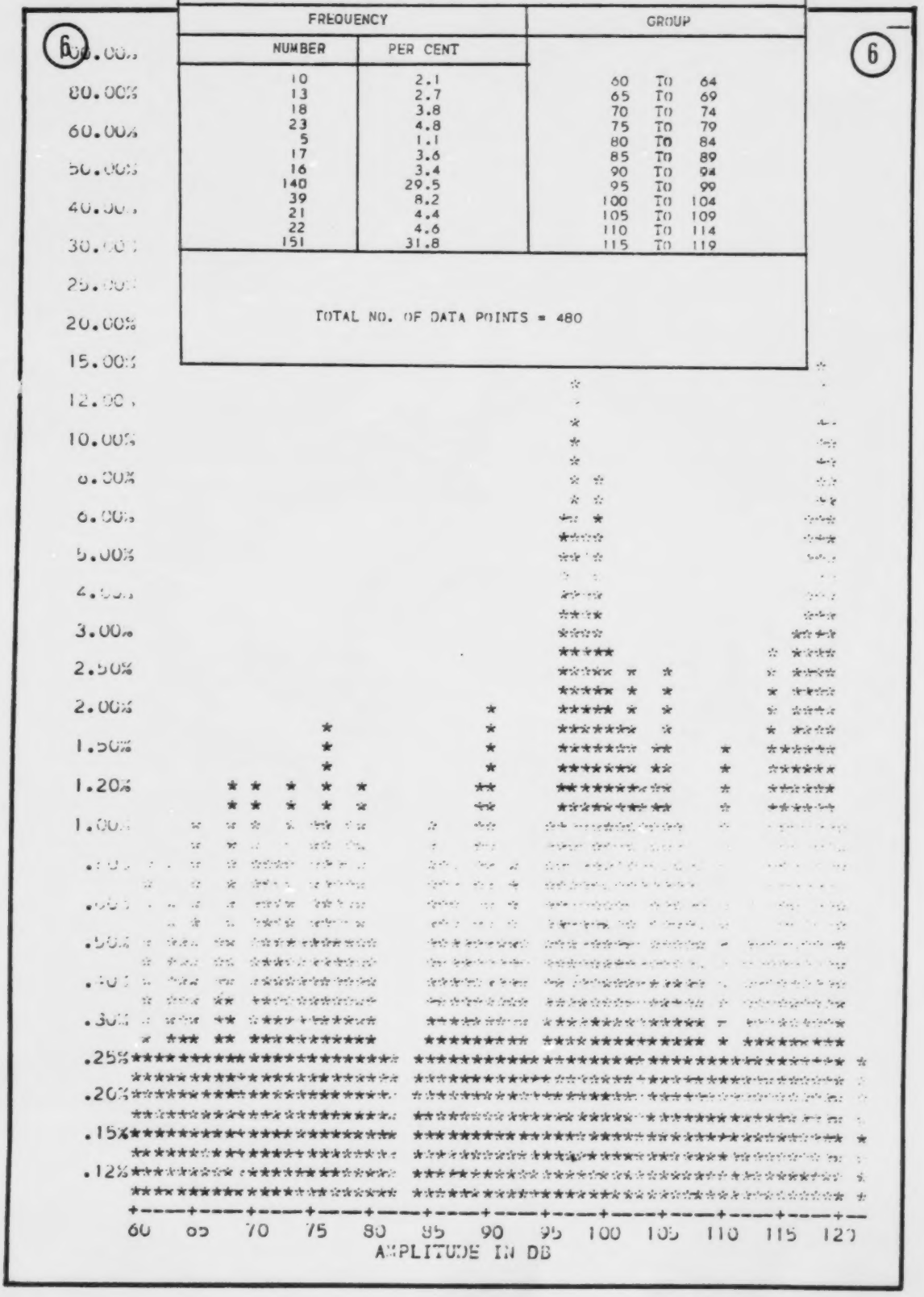
[illegible] HISTORY ANALYSIS

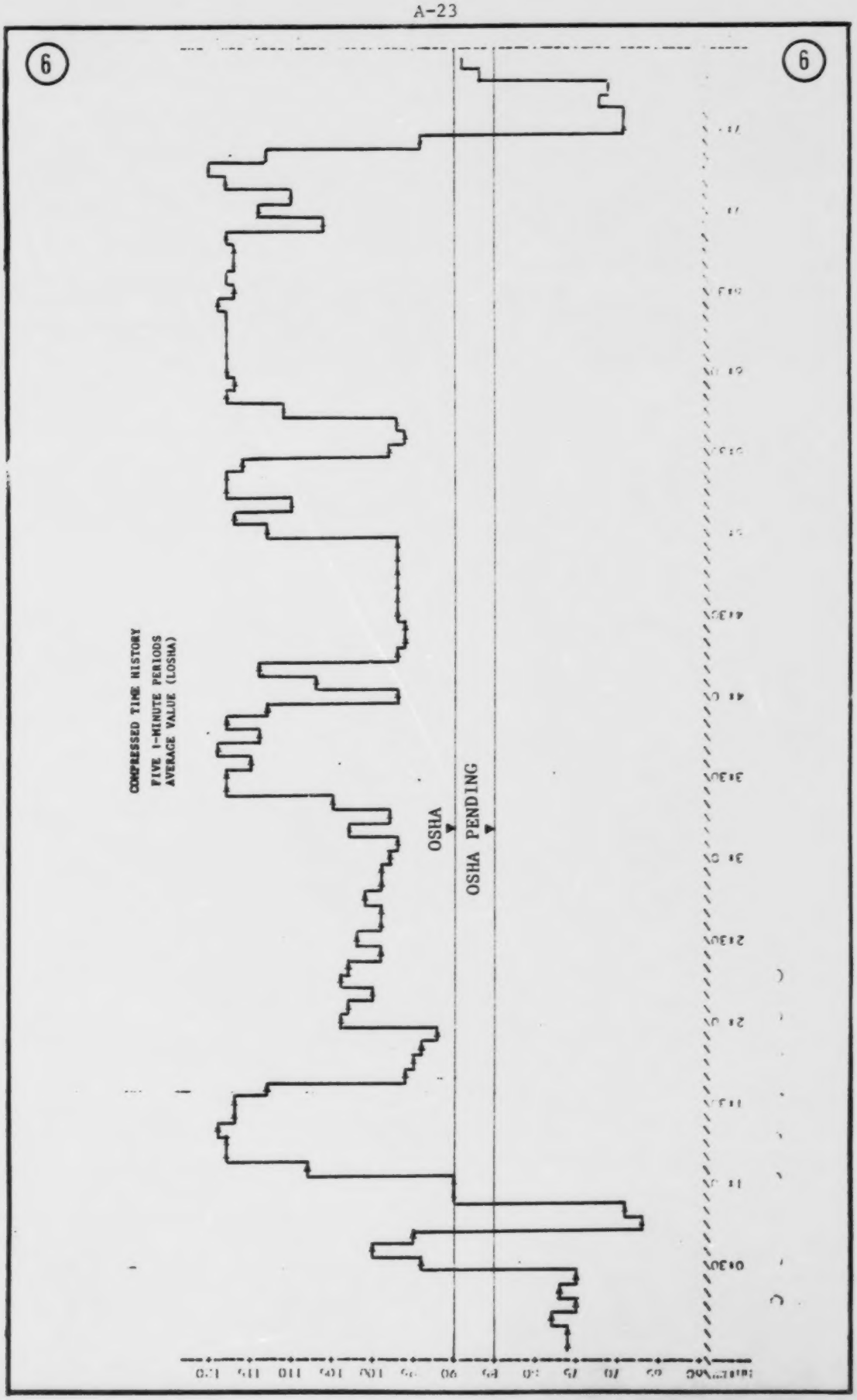
[illegible] FOR [illegible]
[illegible] = 7 [illegible] 7 [illegible]
[illegible] ([illegible]) [illegible] =
[illegible] (CC203) [illegible] =
NUMBER OF COMPUTATIONS = 480
[illegible] = 1 MINUTES

HOUR	[illegible]	CUMULATIVE	[illegible]	[illegible]
1	[illegible].7	88.7	10.497	10.49
2	113.[illegible]	10[illegible]	311.2	311.77
3	1[illegible].2	1[illegible]	[illegible].41	471.15
4	113.4	109.9	312.[illegible]	[illegible].29
5	102.[illegible]	106.0	[illegible].321	[illegible].20
6	11[illegible]	107.4	345.1[illegible]	1[illegible].39
7	117.[illegible]	111.3	[illegible].[illegible]	1[illegible].2
8	1[illegible].7	111.1[illegible]	121.53[illegible]	1[illegible].69

[illegible] [illegible]% = [illegible] [illegible]
[illegible] [illegible] [illegible] = [illegible]
[illegible] = [illegible]
[illegible] = [illegible]
[illegible] [illegible]% = 122.[illegible]

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
10	2.1	60 To 64
13	2.7	65 To 69
18	3.8	70 To 74
23	4.8	75 To 79
5	1.1	80 To 84
17	3.6	85 To 89
16	3.4	90 To 94
140	29.5	95 To 99
39	8.2	100 To 104
21	4.4	105 To 109
22	4.6	110 To 114
151	31.8	115 To 119
TOTAL NO. OF DATA POINTS = 480		




6
6
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(7)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

```
  1  26  80  1221    60    64     4     1
      12      115200  480
  60  62  70  63  63  72  66  74  74  61  61  62  60  60  62  67
  60  62  63  63  60  60  60  60  60  60  60  62  68  75  66  68
  63  69  69  91  99  98  99  97  98  97  95  98  94  84  75  67
  67  63  60  60  60  60  60  70  80  86  96  77  88  86  86  86
  88  88  91  91  96  93  71  73  77  81  85  87  88  93  94  96
  96  97  98  97  97  96  93  92  95  97  97  97  95  93  93  91
  96  97  97  95  94  93  89  89  94  97  98  95  95  93  89  80
  91  78  83  86  85  89  73  56  77  95  96  97  95  93  84  95
  86  94  97  99  97  97  95  90  92  95 100 100  94  85  84  85
  85  85  85  84  85  87  87  87  86  85  87  88  82  83  87  86
  86  87  86  86  87  86  86  91  93  90  87  86  85  83  86  86
  88  87  86  86  87  88  89  88  87  87  89  90  88  87  89  89
  87  90  89  89  88  87  87  87  87  87  87  87  87  87  87  87
  87  86  89  89  89  88  89  88  88  87  88  86  85  84  85  86
  89  89  90  88  88  88  87  86  89  89  89  89  89  89  88  88
  88  87  87  87  87  87  87  88  86  87  88  88  88  89  89  89
  88  88  88  88  88  88  88  89  88  90  89  87  87  88  87  87
  87  88  87  88  88  90  89  87  87  86  86  88  88  87  87  87
  88  87  88  88  88  88  88  88  89  88  89  90  88  89  90  89
  89  89  90  90  88  88  86  88  87  84  85  88  90  89  89  89
  89  92  97 101  99  97  97  93  77  76  88  92  93  95  97  96
  85  86  84  85  85  86  84  85  84  84  84  84  85  86  89  85
  86  88  84  84  84  84  84  83  83  85  84  84  84  85  86  85
  85  84  85  86  86  86  86  86  86  87  85  86  87  87  88  86
  88  85  85  84  85  84  84  84  84  84  85  86  85  84  85  85
  85  85  87  87  89  86  85  85  81  81  80  80  81  81  87  85
  87  86  89  92  88  96  97  99  86  86  86  85  92  97 101  94
  73  75  67  65  60  60  60  60  60  60  60  60  62  82  86  74
  65  67  68  92  91  86  64  95  98  82  66  79  82  76  64  60
  68  66  61  60  60  60  60  60  60  60  60  60  60  60  60  60
$EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 20/07/79
ENTER SITE CODE (5 CHARS) : CC203

ENTER USER CODE (4 CHARS) : 4721
 ENTER JOB CODE (3 CHARS) : 274
```

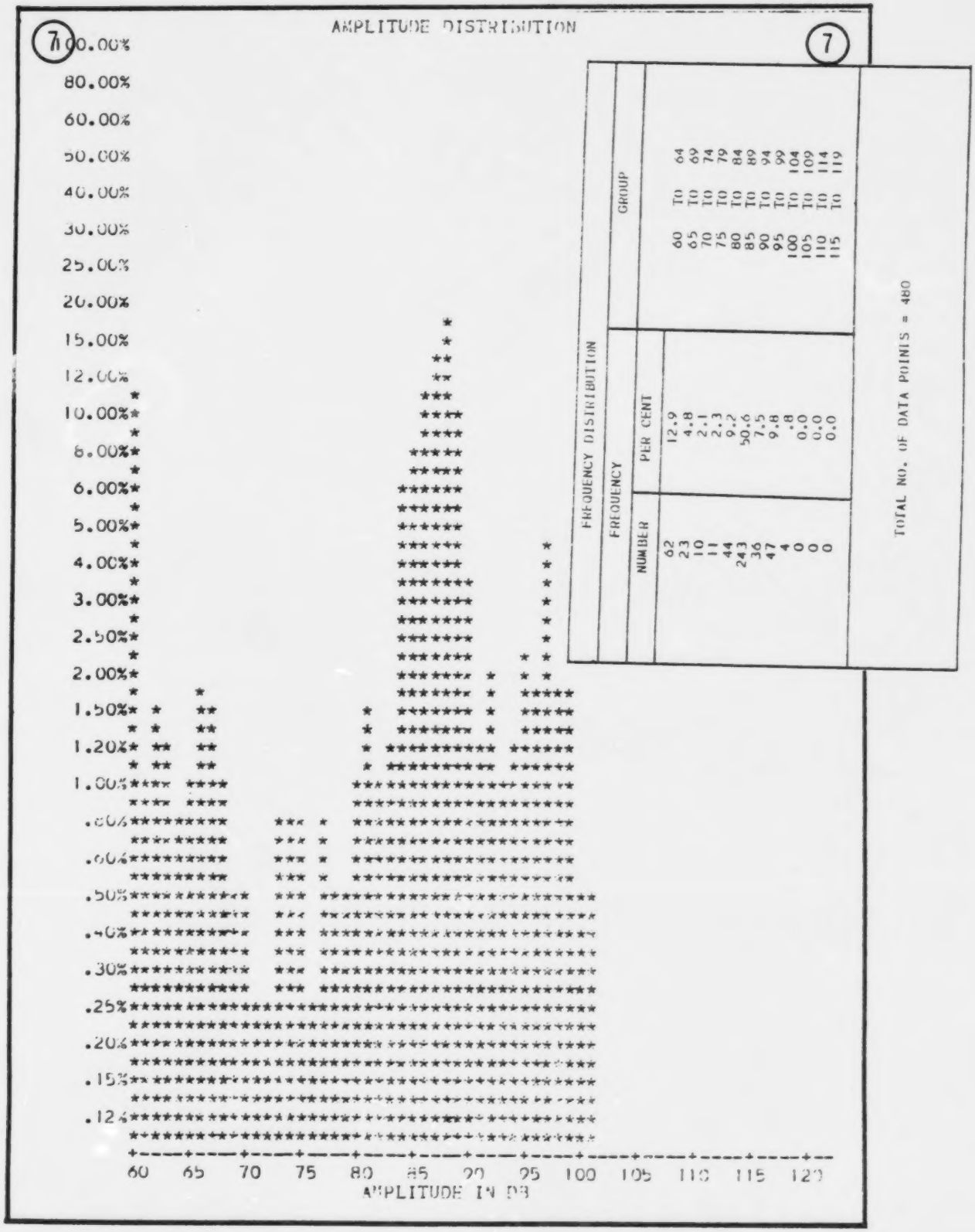
```
    DATA LOGGED :20 JULY 1979          DATA ANALYZED : 17 SEPT 1979
         LOGGER : 08-301/26                 SITE CODE : CC203
  SERIAL NUMBER : 1221                       JOB CODE : 274
       BASELINE : 60 DB                     USER CODE : 4721
  DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
  SAMPLING RATE :  4/SEC              TOTAL SAMPLES =  115200
  TEST DURATION =   8 HR 0            STANDBY TIME =   0 HR 3
```

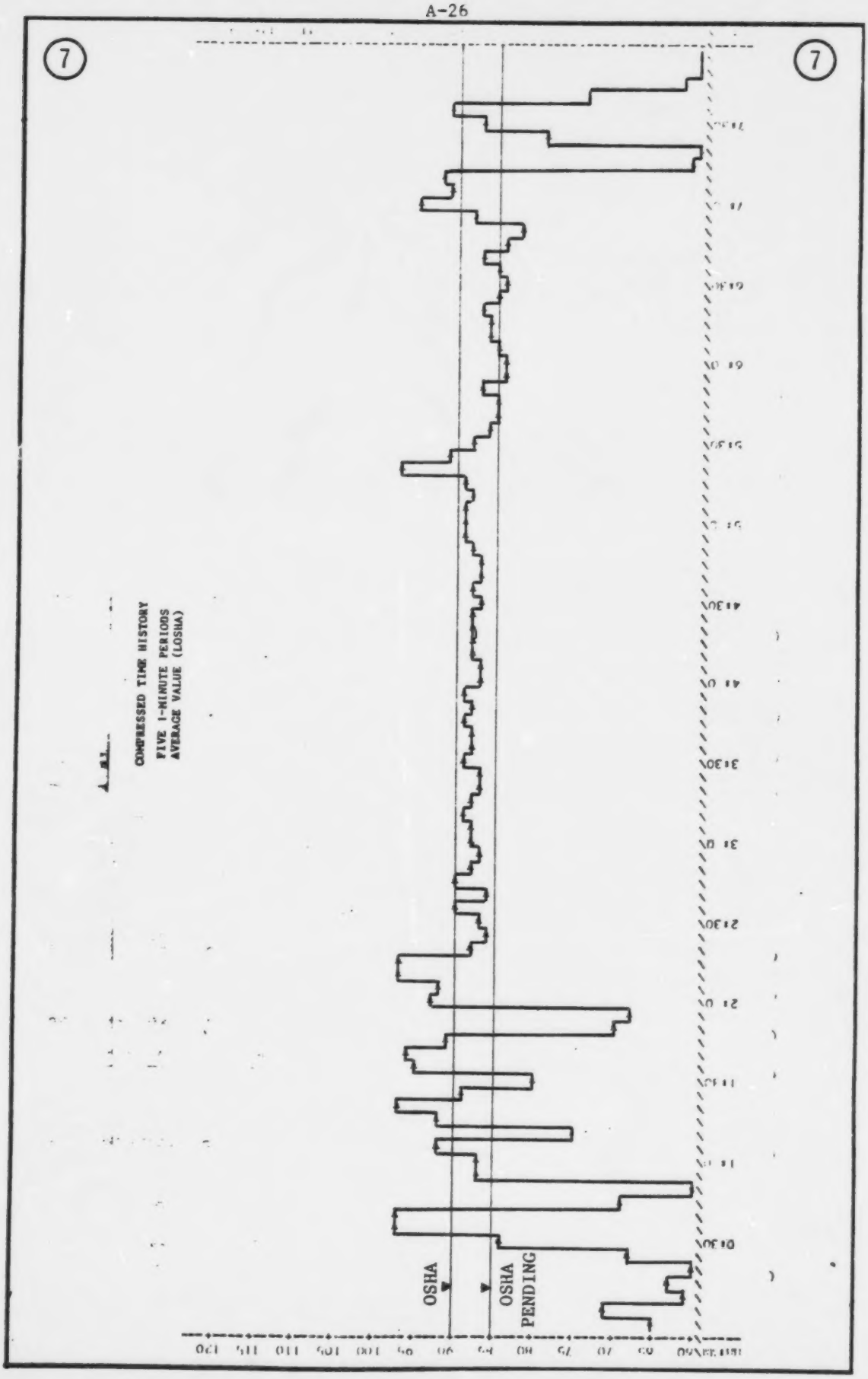
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.7	85.7	6.903	6.90
2	90.5	88.5	13.441	20.34
3	91.1	89.5	14.019	34.36
4	88.2	89.2	9.679	44.04
5	87.9	88.9	9.324	53.36
6	89.0	89.0	10.443	64.91
7	85.4	88.5	6.546	71.45
8	85.6	88.2	6.825	78.28

MIN. COMP. = 60 DB MAX. COMP. = 101 DB
ARITHMETIC MEAN = 83 DB
STD. DEVIATION = 11 84
VARIANCE =121 DB


AMPLITUDE DISTRIBUTION
7
7
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 62 12.9
65 TO 69 23 4.8
70 TO 74 10 2.1
75 TO 79 11 2.3
80 TO 84 44 9.2
85 TO 89 243 50.6
90 TO 94 36 7.5
95 TO 99 47 9.8
100 TO 104 4 .8
105 TO 109 0 0.0
110 TO 114 0 0.0
115 TO 119 0 0.0
TOTAL NO. OF DATA POINTS = 480


7
7
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(8)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226   60   64    4    1
      54      115200  480
  60  60  60  60  60  60  60  60  60  60  60  60  60  69  68  64
  60  60  77  71  60  74  60  60  63  60  60  60  60  60  60  60
  60  60  60  64  66  75  75  69  60  60  60  60  60  60  60  60
  60  60  61  66  60  60  60  60  60  60  60  62  76  84  92  71
  60  71  69  88  87  90  90  89  92  91  91  90  91  92  91  90
  91  91  91  90  90  90  90  90  90  90  89  89  90  90  90  90
  90  90  89  89  89  89  89  90  89  87  89  89  89  88  88  89
  88  87  88  85  88  86  86  81  86  89  89  89  90  90  90  90
  90  90  93  91  91  93  92  92  92  90  88  89  90  92  92  93
  93  93  92  92  92  92  91  93  92  92  92  93  94  94  94  94
  93  95  96  96  97  97  97  95  94  96  97  96  97  97  96  97
  97  96  98  98  98  99  98  98  98  90  86  87  86  85  84  83
  84  82  82  81  82  78  77  76  77  82  74  75  72  84  76  76
  76  72  77  69  70  66  63  76  64  69  65  61  60  60  60  67
  60  60  60  63  60  60  60  60  60  60  60  60  60  60  60  61
  60  60  64  60  61  60  60  60  60  85  94  81  89  84  65  74
  60  60  60  60  60  60  60  60  60  60  64  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  61  66  60  62  85  89  78  70  86  86  82  81  88
  90  70  62  61  60  60  60  60  60  60  60  60  60  60  60  89
  86  85  90  94  88  92  92  92  92  93 100  60  60  60  61  61
  60  60  62  60  60  60  60  60  60  60  60  60  62  60  60  60
  60  61  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  61  60  60  60  60  61  60
  60  60  60  60  61  60  60  60  60  60  62  60  60  60  60  60
  60  60  60  60  61  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  64  60  60  60  60  60  60  60  60  60
  60  60  60  82  92  88  83  91  90  92  83  81  91  96  96  98
  98  98  97  98  98  97  96  97  94  87  89  74  77  60  60  61
  67  60  60  60  60  60  60  81  85  68  60  71  61  60  61  60
%EOF
```

(8)

```
ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 2SSYA
ENTER USER CODE (4 CHARS) : 4710
 ENTER JOB CODE (3 CHARS) : GSL
```

```
   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 2SSYA
SERIAL NUMBER : 1226                       JOB CODE : GSL
     BASELINE : 60 DB                     USER CODE : 4710
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0            STANDBY TIME =   0: 0:13
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	84.0	84.0	.342	.34
2	88.8	84.0	10.536	10.88
3	93.5	88.7	20.393	31.27
4	83.5	87.7	5.058	36.33
5	74.7	86.4	1.491	37.82
6	82.0	85.8	4.152	41.97
7	80.1	84.7	.198	42.17
8	87.6	85.2	8.958	51.13

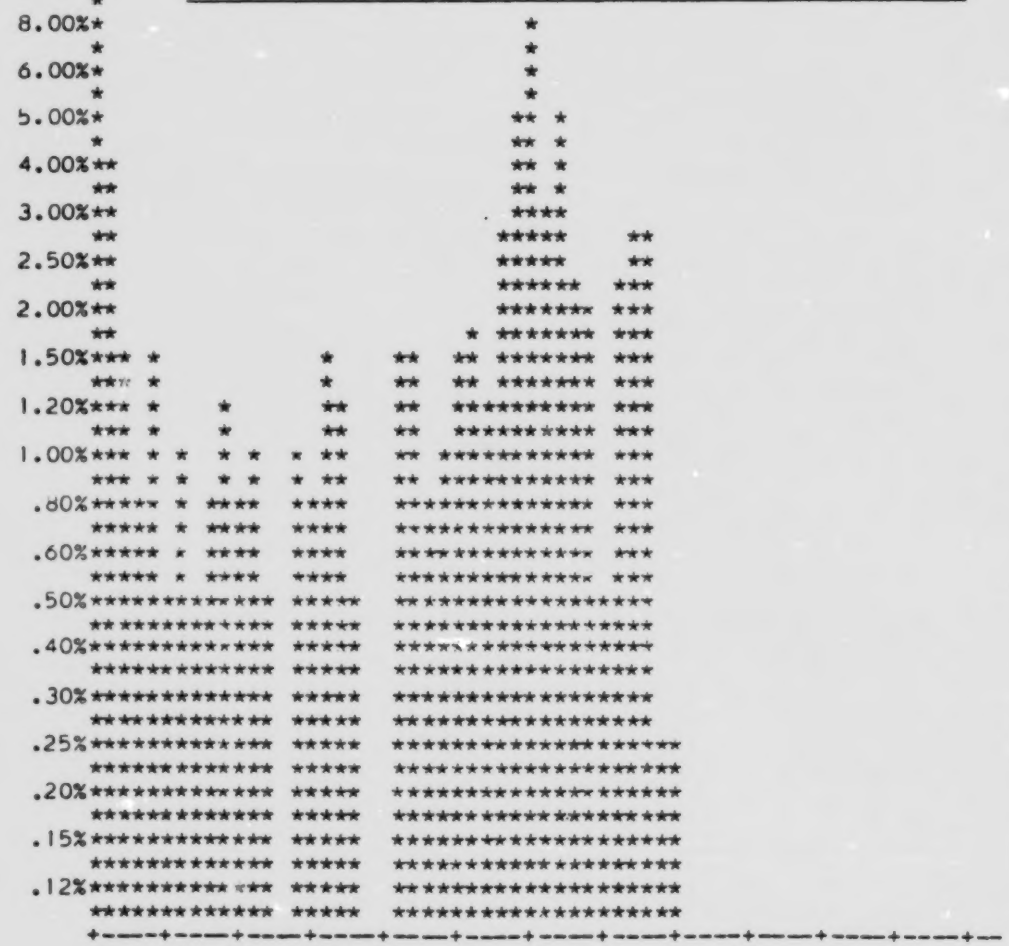
```
MIN. COMP. =  60 DB              MAX. COMP. = 100 DB
ARITHMETIC MEAN =  72 DB
STD. DEVIATION =  15 DB
VARIANCE =225 DB
```

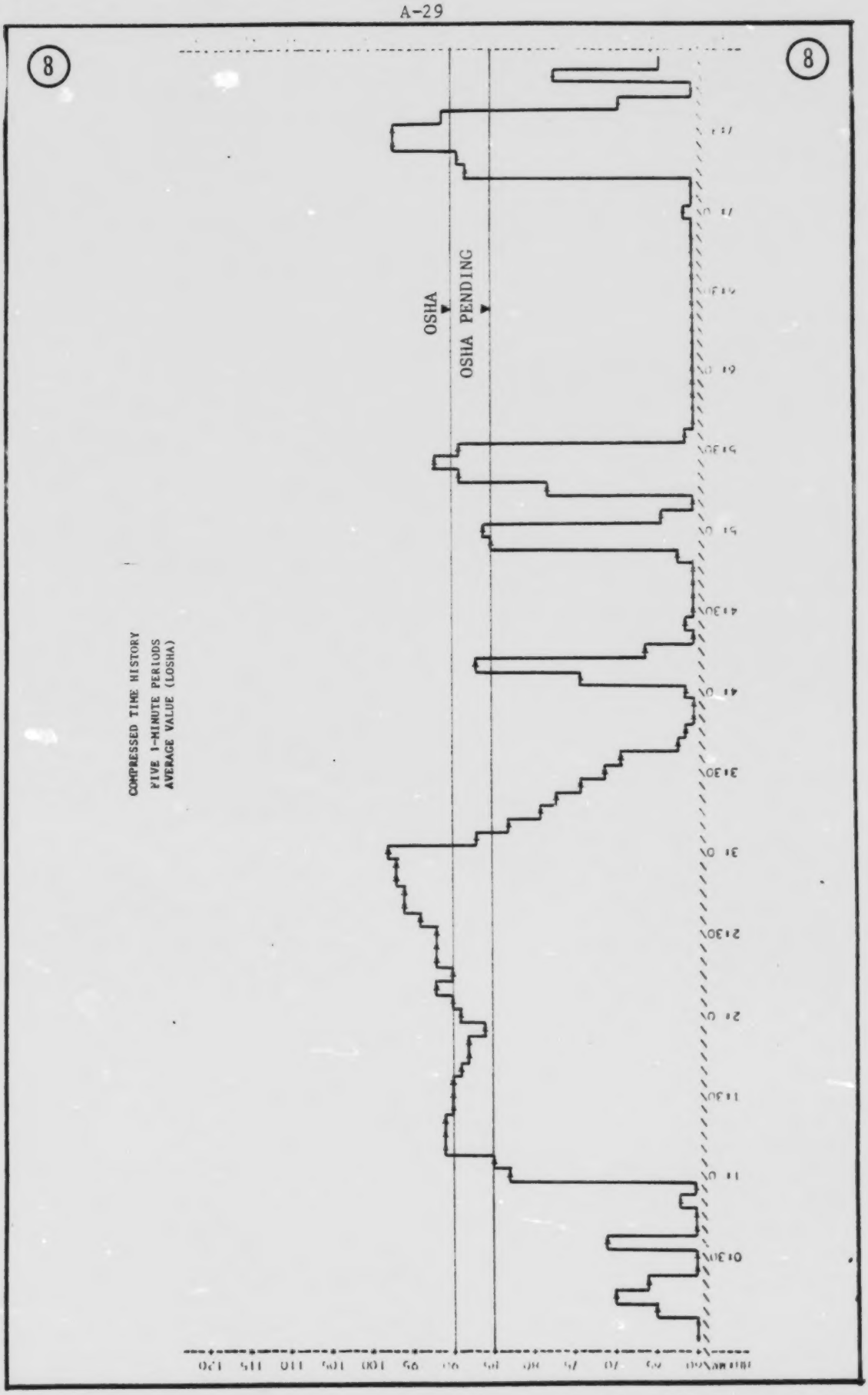
AMPLITUDE DISTRIBUTION

(8) (8)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
251	52.3	60 TO 64
16	3.3	65 TO 69
13	2.7	70 TO 74
16	3.3	75 TO 79
19	4.0	80 TO 84
50	10.4	85 TO 89
80	16.7	90 TO 94
34	7.1	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




8
8
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(9)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1212    60    64     4     1
     112     115200  480
 65  60  60  60  61  61  65  68  67  64  60  62  60  60  60  60
 60  60  60  60  60  60  61  63  61  70  77  63  62  72  62  62
 72  64  60  62  63  60  64  75  63  61  73  60  73  60  60  74
 67  60  62  60  60  60  60  67  64  60  62  71  62  65  81  68
 69  66  63  71  60  67  67  76  72  66  70  60  60  60  60  65
 62  62  61  60  60  60  61  66  66  60  60  60  63  87  70  66
 71  60  60  60  63  60  67  73  60  60  60  60  63  60  60  60
 60  60  60  60  60  60  60  60  77  83  82  84  84  86  73
 74  75  70  76  75  73  84  73  61  76  80  85  69  62  61  67
 72  72  71  71  72  60  62  77  66  62  63  60  60  60  60  60
 60  62  60  60  60  60  60  60  60  62  60  63  60  60  60  60
 60  60  60  61  60  61  60  60  70  60  65  62  62  60  60  60
 60  60  60  60  60  67  62  60  60  60  60  60  60  60  73  86
 91  89  94  95  94  94  87  73  70  72  84  78  64  76  80  91
 97  98  98  85  73  78  87  86  86  86  86  86  86  86  88  87
 87  87  87  92  97  97  97  98  99  97  98  74  60  60  73  84
 99  99 100  96  88  60  60  60  60  60  60  60  70  60  60  60
 60  60  60  60  60  60  74  97  99  99 101  99  99  99  99  95
 94  88  88  88  90  89  90  89  91  97 100 101 101 102  98  87
 87  87  87  88  96 101 100  99  99 100 101  85  82  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  64  79  64  67  60  69  71
 82  88  90  98  97  88  87  85  78  83  84  81  86  68  60  61
 61  73  83  83  83  83  82  82  82  84  84  82  83  82  84  82
 84  84  84  82  82  83  82  85  85  84  85  83  83  83  83  85
 82  89  94  67  72  64  60  76  94  92  90  95  96  80  80  77
 80  82  81  89  95  97  84  82  81  81  79  79  80  80  82  88
 82  85  86  75  78  80  87  78  79  81  82  81  83  97  97  95
 94  87  81  73  66  60  68  66  67  68  75  61  61  83  82  84
 84  83  84  83  83  82  83  82  81  84  85  85  84  84  84  84
EOF


ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : SHAFT
ENTER USER CODE (4 CHARS) : 4805
 ENTER JOB CODE (3 CHARS) : 296


   DATA LOGGED :31 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26               SITE CODE : SHAFT
 SERIAL NUMBER : 1212                     JOB CODE : 296
      BASELINE : 60 DB                   USER CODE : 4805
 DYNAMIC RANGE : 64 DB                    THRESHOLD :  80 DB
 SAMPLING RATE :  4/SEC            TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0          STANDBY TIME =   0: 0:28

            TIME HISTORY ANALYSIS

 NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
 ARE BASED ON THE FOLLOWING:
 100% DOSE = 90 DB / 8 HRS
 EXCHANGE (DOUBLING) RATE = 5 DB
 THRESHOLD (CUTOFF) LEVEL = 80 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD =  1 MINUTES

 TIME          LOSHA                      %DOSE
 HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
    1        65.3        65.3         .404         .40
    2        67.6        66.5         .558         .96
    3        73.5        69.6        1.262        2.22
    4        84.8        77.0        6.062        8.29
    5        92.8        83.9       18.495       26.75
    6        89.3        86.1       11.281       38.06
    7        84.5        85.0        5.408       43.47
    8        85.1        85.0        6.337       50.21
 MIN. COMP. =  60 DB              MAX. COMP. = 102 DB
 ARITHMETIC MEAN =  73 DB
 STD. DEVIATION =  13.01
 VARIANCE =169 DB
```

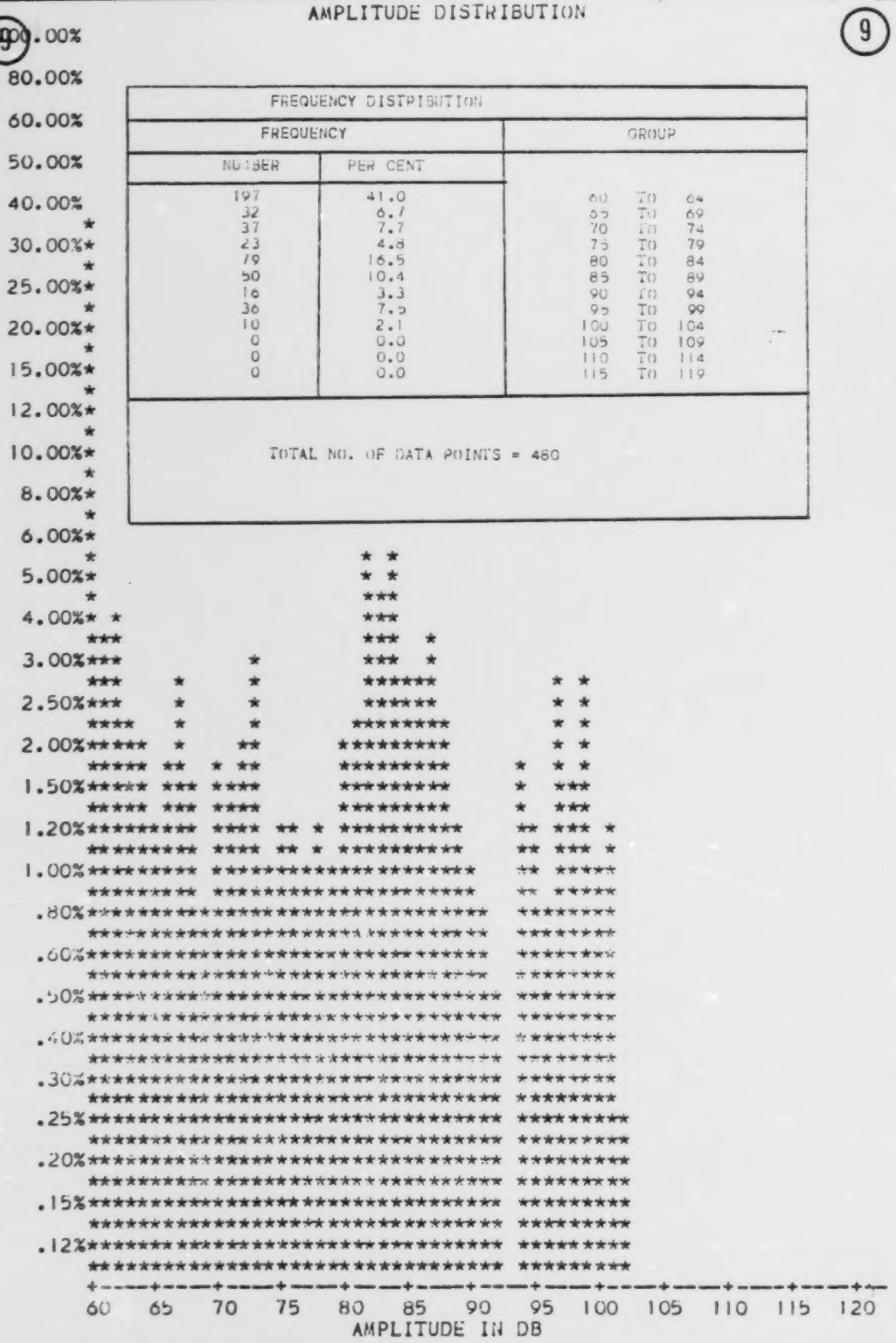
(9)

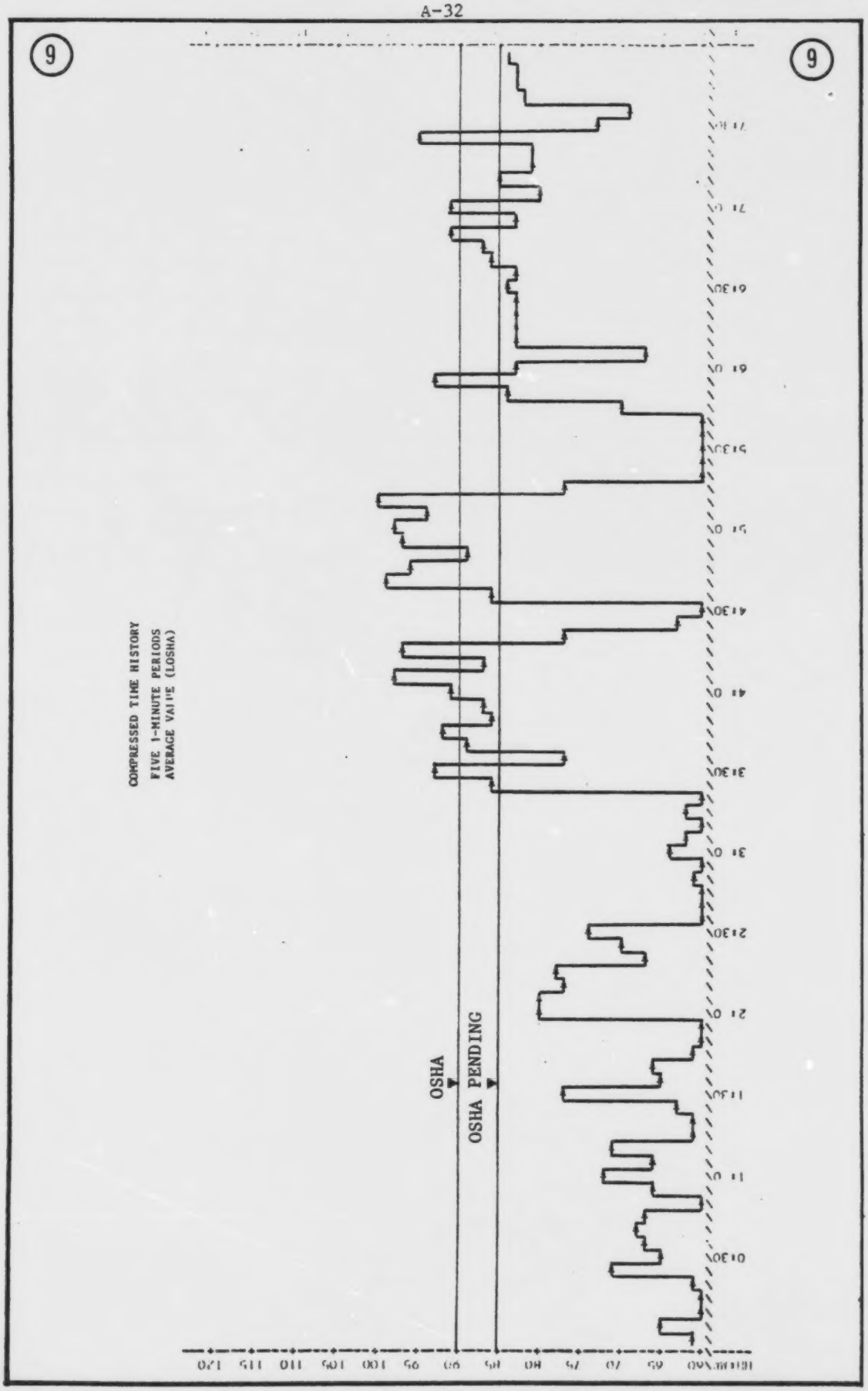
AMPLITUDE DISTRIBUTION

9 9

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
197	41.0	60 TO 64
32	6.7	65 TO 69
37	7.7	70 TO 74
23	4.8	75 TO 79
79	16.5	80 TO 84
50	10.4	85 TO 89
16	3.3	90 TO 94
36	7.5	95 TO 99
10	2.1	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




9
9
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
60 65 70 75 80 85 90 95 100 105 110 115 120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(10)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1224    60    64     4     1
     42      115200   480
 60  67  64  61  61  71  60  60  60  60  60  60  60  62  60  60
 60  60  60  60  60  60  64  70  61  72  78  62  66  61  62  60
 63  66  60  60  64  60  64  60  60  62  67  60  60  60  65  64
 67  60  60  77  90  73  70  71  67  63  60  60  60  75  64  60
 60  60  60  63  80  79  66  63  60  64  66  60  61  61  65  83
 79  68  62  62  60  60  60  61  81  93  65  76  85  78  81  64
 60  64  83  95 100  98  96 100  96  83  67  74  71  66  71  68
 80  82  83  81  82  79  73  78  88  77  79  86  85  76  65  70
 64  67  70  66  61  71  64  67  73  74  75  75  64  62  79  76
 77  71  72  82  87  93  92  89  88  90  90  91  91  86  86  85
 87  90  85  81  80  75  77  74  83  88  90  92  92  91  91  91
 85  85  86  96  93  97  90  90  93  90  86  84  73  66  66  71
 70  75  70  73  90  95  90  81  87  98  90  90  56  90  94  93
 89  92  72  76  81  84  81  79  73  79  76  79  78  65  60  77
 79  75  78  69  68  70  64  70  71  76 102  72  66  67  81  81
 76  67  67  72  69  68  63  60  61  66  80  69  66  88  90 100
 80  71  65  75  72  74  60  60  60  60  69  61  76  64  72  60
 63  66  64  71  61  60  62  64  70  64  60  60  60  60  60  60
 60  60  61  69  60  60  60  60  72  61  60  60  60  60  60  60
 60  60  60  60  73  61  64  74  68  62  61  60  65  69  68  66
 85  76  61  64  60  61  60  63  71  68  84  94  93  91  87  90
 69  65  90  92  83  74  73  74  76  75  70  69  60  60  62  61
 60  61  63  60  71  65  60  63  67  81  68  60  62  60  74  61
 60  60  60  67  67  60  60  81  60  60  60  60  60  60  60  60
 65  80  79  60  60  60  60  60  70  60  60  62  62  60  60  60
 78  76  84  78  77  60  65  60  80  80  79  60  66  82  64  60
 60  60  61  66  62  72  82  76  83  83  83  78  76  70  80  77
 81  85  85  77  76  81  82  73  75  78  80  79  80  83  67  79
 69  82  72  83  72  67  65  60  60  63  73  72  76  91  81  81
 81  81  82  82  82  82  82  82  82  83  82  83  82  82  81  82
%EOF
```

(10)

```
ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : SHAFT
ENTER USER CODE (4 CHARS) : 4807
 ENTER JOB CODE (3 CHARS) : 296
```

```
   DATA LOGGED :31 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : SHAFT
 SERIAL NUMBER : 1224                      JOB CODE : 296
      BASELINE : 60 DB                    USER CODE : 4807
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
 SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:10
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGIA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	68.0	68.0	.596	.60
2	83.9	79.7	5.375	5.97
3	85.2	82.0	6.402	12.37
4	86.1	83.3	7.266	19.63
5	75.8	82.3	1.749	21.38
6	78.3	81.7	2.459	23.84
7	71.0	80.9	.895	24.73
8	79.9	80.8	3.093	27.83

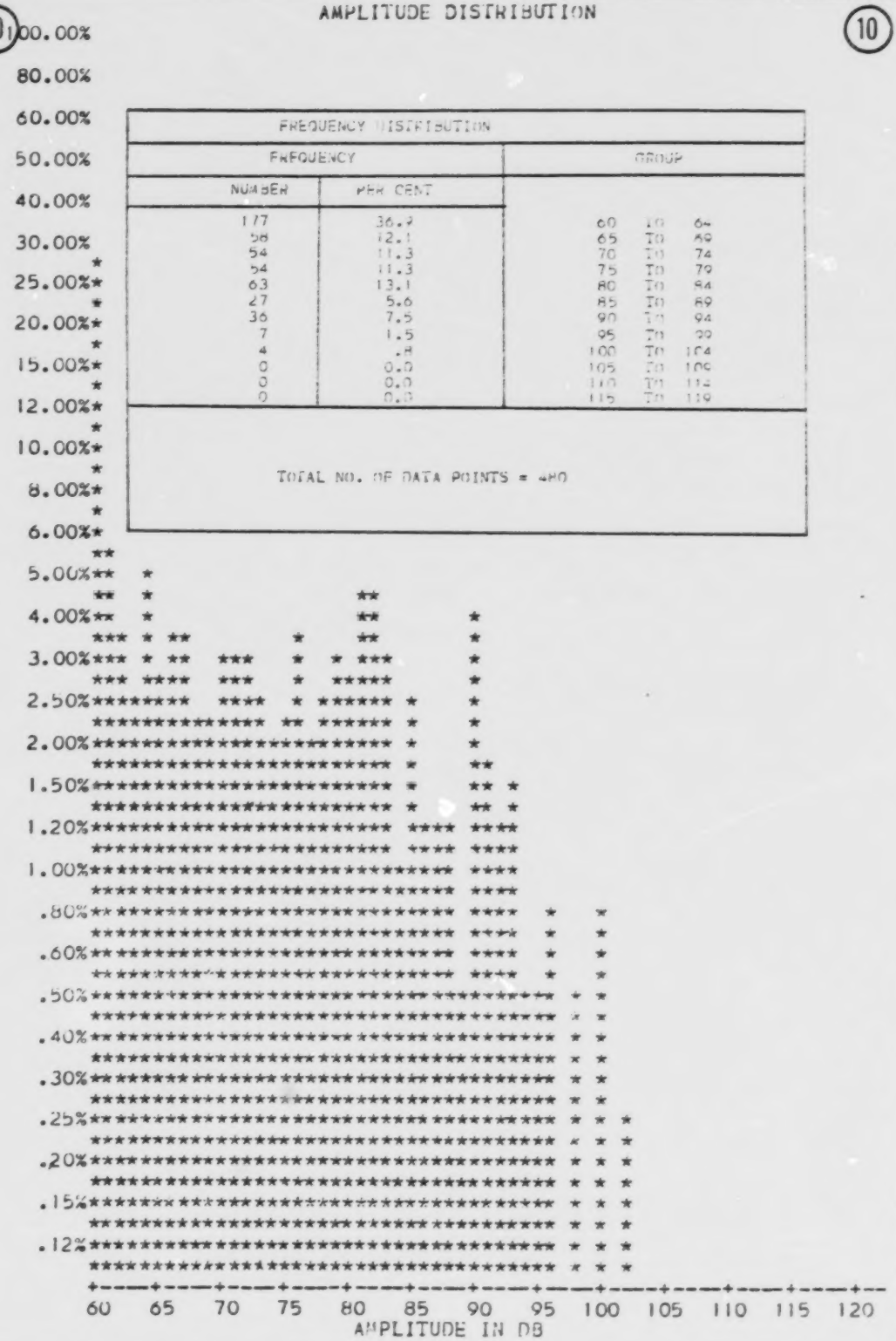
```
MIN. COMP. =  60 DB                  MAX. COMP. = 102 DB
ARITHMETIC MEAN =  71 DB
STD. DEVIATION =  11 DB
VARIANCE =121 DB
```

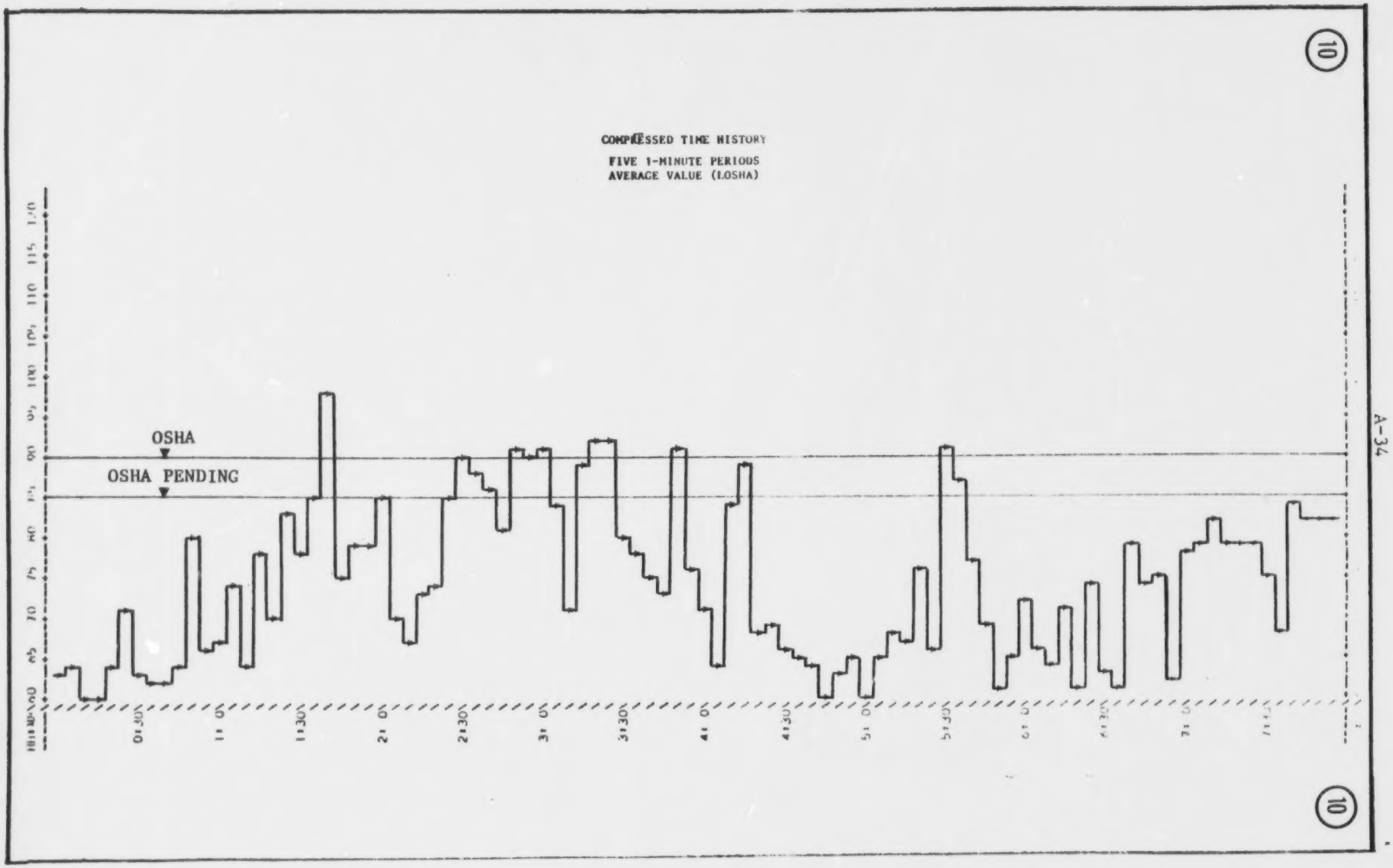
AMPLITUDE DISTRIBUTION

(10) (10)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
177	36.9	60 TO 64
58	12.1	65 TO 69
54	11.3	70 TO 74
54	11.3	75 TO 79
63	13.1	80 TO 84
27	5.6	85 TO 89
36	7.5	90 TO 94
7	1.5	95 TO 99
4	.8	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
10
10

(11)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1216    60    64     4     1
     101     115200  480
  65  60  60  60  64  66  68  69  65  67  61  62  62  65  63  69
  66  66  75  71  73  72  70  68  70  64  70  66  62  64  68  68
  65  65  60  62  68  60  65  67  70  67  71  72  61  68  61  62
  66  62  70  60  63  69  68  76  73  72  68  64  71  60  60  60
  60  60  60  60  63  60  60  67  75  78  74  70  75  63  73  70
  70  80  75  70  65  62  68  75  69  79  69  60  77  69  68  62
  64  62  81  83  82  81  85  85  84  82 102  85  68  83  85  85
  82  91  84  82  83  91  82  83  84  88  80  79  78  80  81  82
  81  83  81  82  81  81  75  78  82  81  83  84  82  83  81  84
  83  86  76  73  83  85  81  81  79  77  83  84  84  85  84  84
  84  84  84  87  84  84  96  91  84  83  77  69  92  77  67  67
  87  83  89  78  91  84  83  84  85  80  75  78  78  83  83  72
  82  85  90  86  89  85  78  78  86  81  64  74  79  78  71  76
  71  81  67  62  74  76  69  67  74  87  79  71  60  71  81  68
  80  77  63  72  68  68  64  72  69  76  72  74  83  79  81  66
  60  60  66  67  67  61  60  74  82  60  60  70  82  86  80  83
  71  72  77  75  61  64  71  66  79  73  80  61  60  72  73  65
  60  69  60  65  63  76  66  60  62  60  70  77  71  76  81  81
  83  84  84  88  85  84  84  83  85  83  83  76  92  73  82  83
  83  84  83  83  83  84  84  83  83  83  83  83  84  84  85  85
  84  84  84  84  84  83  83  83  83  83  83  84  83  84  84  84
  85  82  82  83  82  82  81  82  81  81  81  81  81  81  81  80
  81  81  81  82  81  81  82  83  71  79  81  80  80  82  77  76
  70  66  71  66  63  67  67  70  76  73  68  74  76  69  77  60
  70  65  70  60  69  77  83  83  83  84  85  85  86  83  83  83
  85  83  84  83  84  81  83  82  84  87  83  82  82  81  81  84
  84  81  82  85  86  85  76  82  89  84  87  98  88  87  87  91
  92  82  83  80  82  83  84  82  80  90  84  85  95  93  95  90
  91  90  90  89  91  90  89  89  84  84  83  85  88  86  86  88
  86  79  84  88  86  86  86  86  86  86  85  87  87  86  82  80
$EOF


ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : SHAFT
ENTER USER CODE (4 CHARS) : 4663
 ENTER JOB CODE (3 CHARS) : 296

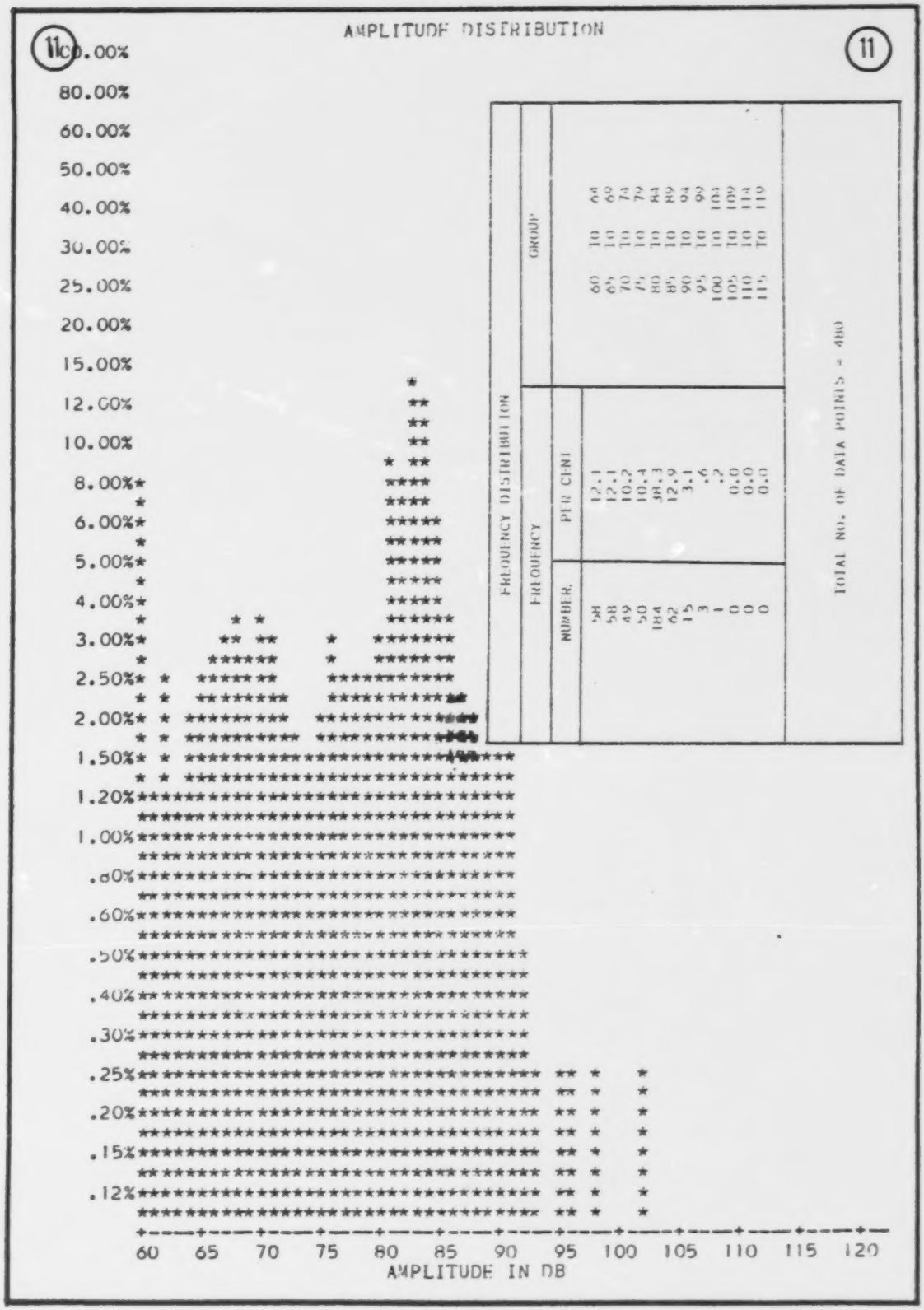

   DATA LOGGED :31 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : SHAFT
 SERIAL NUMBER : 1216                       JOB CODE : 296
      BASELINE : 60 DB                     USER CODE : 4663
 DYNAMIC RANGE : 64 DB                      THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC                  TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0               STANDBY TIME =   0: 0:25

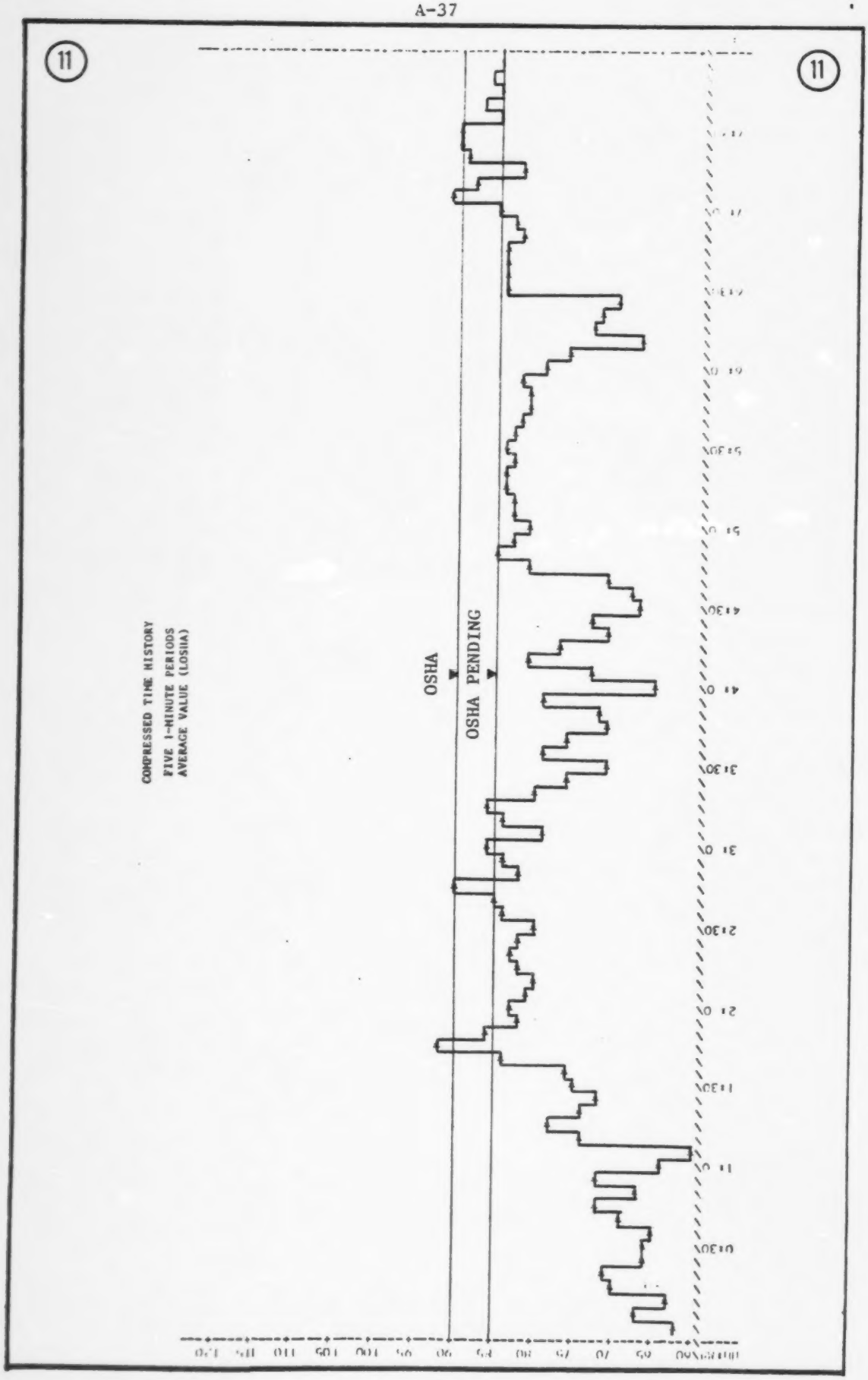
                TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                    DOSE
HOUR     CURRENT   CUMULATIVE     CURRENT   CUMULATIVE
   1        68.1         68.1        .602          .60
   2        81.2         77.3       3.700         4.30
   3        83.5         80.0       5.070         9.36
   4        80.1         80.0       3.150        12.53
   5        77.4         79.6       2.165        14.70
   6        82.7         80.2       4.550        19.25
   7        80.2         80.2       3.199        22.45
   8        87.3         81.6       8.836        31.28
MIN. COMP. =  60 DB                MAX. COMP. =  102 DB
ARITHMETIC MEAN =  77 DB
STD. DEVIATION =   9 DB
VARIANCE = 81 DB
```

(11)


AMPLITUDE DISTRIBUTION
11
11
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
12.1
12.1
10.2
10.4
38.3
12.9
3.1
.6
.2
0.0
0.0
0.0
TOTAL NO. OF DATA POINTS = 480


11
11
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
24:00
60
65
70
75
80
85
90
95
100
105
110
115
120

(12)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

1 26 80 1225 60 64 4 1
143 115200 480

60	60	68	63	60	61	60	60	60	60	60	60	60	61	62
61	60	61	60	62	60	60	67	73	62	67	79	72	75	68	62
62	68	69	62	60	60	62	61	61	61	60	61	60	60	60	60
70	65	61	60	76	89	65	72	68	62	61	60	60	60	69	60
60	60	60	60	70	73	67	61	63	60	68	71	74	73	66	67
60	60	61	65	69	69	60	62	65	65	60	67	71	76	73	72	72
72	60	67	91	98	103	98	100	103	92	81	75	76	73	72	72
81	89	84	86	84	88	80	76	80	89	78	82	78	86	75	68
71	69	73	73	78	69	66	70	71	67	70	72	70	74	62	70
71	77	76	82	83	92	91	92	93	92	94	93	94	92	94	93
82	83	90	80	81	78	77	73	77	83	90	90	94	95	92	93
90	83	86	86	96	88	92	90	88	94	91	86	80	81	89	89
80	78	83	79	82	93	93	90	86	89	95	89	93	85	90	94
92	95	91	75	78	78	75	76	76	67	82	71	69	70	80	80
77	71	76	73	68	81	80	68	80	89	74	92	88	80	83	71
79	71	73	75	82	73	75	86	89	75	82	86	85	71	90	93
99	71	67	68	71	72	67	80	80	80	80	80	80	80	80	81
80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
80	80	80	80	80	80	80	80	80	73	80	80	80	80	80	80
80	80	80	80	81	82	80	80	80	80	80	80	80	88	84	87
77	87	88	82	83	87	80	89	84	88	74	82	88	89	91	90
88	82	77	87	82	78	88	86	83	89	84	71	82	81	80	80
80	80	80	80	87	83	80	80	80	80	80	80	80	84	80	86
80	80	80	80	87	80	80	80	72	80	80	80	80	80	80	80
80	82	84	88	80	80	80	80	81	80	80	80	80	80	80	80
84	88	85	75	80	85	80	80	80	74	80	80	80	83	82	80
80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
80	80	80	80	80	80	80	80	80	80	80	80	80	80	82	80
80	80	80	80	80	80	80	80	84	82	82	80	80	80	83	83
80	80	85	80	80	80	80	80	80	80	80	80	80	80	80	80

%EOF

ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : SHAFT
ENTER USER CODE (4 CHARS) : 4806
ENTER JOB CODE (3 CHARS) : 296

DATA LOGGED : 31 JULY 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1225
BASELINE : 60 DB
DYNAMIC RANGE : 94 DB
SAMPLING RATE : 4/3.0
TEST DURATION : [illegible]

DATA ANALYZED : 20 SEPT 1979
SITE CODE : SHAFT
JOB CODE : 296
USER CODE : 4806
THRESHOLD : 60 DB
TOTAL SAMPLES : [illegible]
STARTED TIME : [illegible]

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LEQ(A)		SOUND	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	67.9	67.9	.586	.59
2	85.8	81.4	6.983	7.57
3	85.0	83.3	7.221	14.79
4	85.5	83.9	6.679	21.47
5	75.8	82.8	1.700	23.17
6	76.0	82.1	1.791	24.97
7	62.9	81.0	.292	25.26
8	60.4	80.1	.207	25.47

MIN. COMP. = 60 DB MAX. COMP. = 103 DB
ARITHMETIC MEAN = 69 DB
STD. DEVIATION = 11 DB
VARIANCE = 121 DB

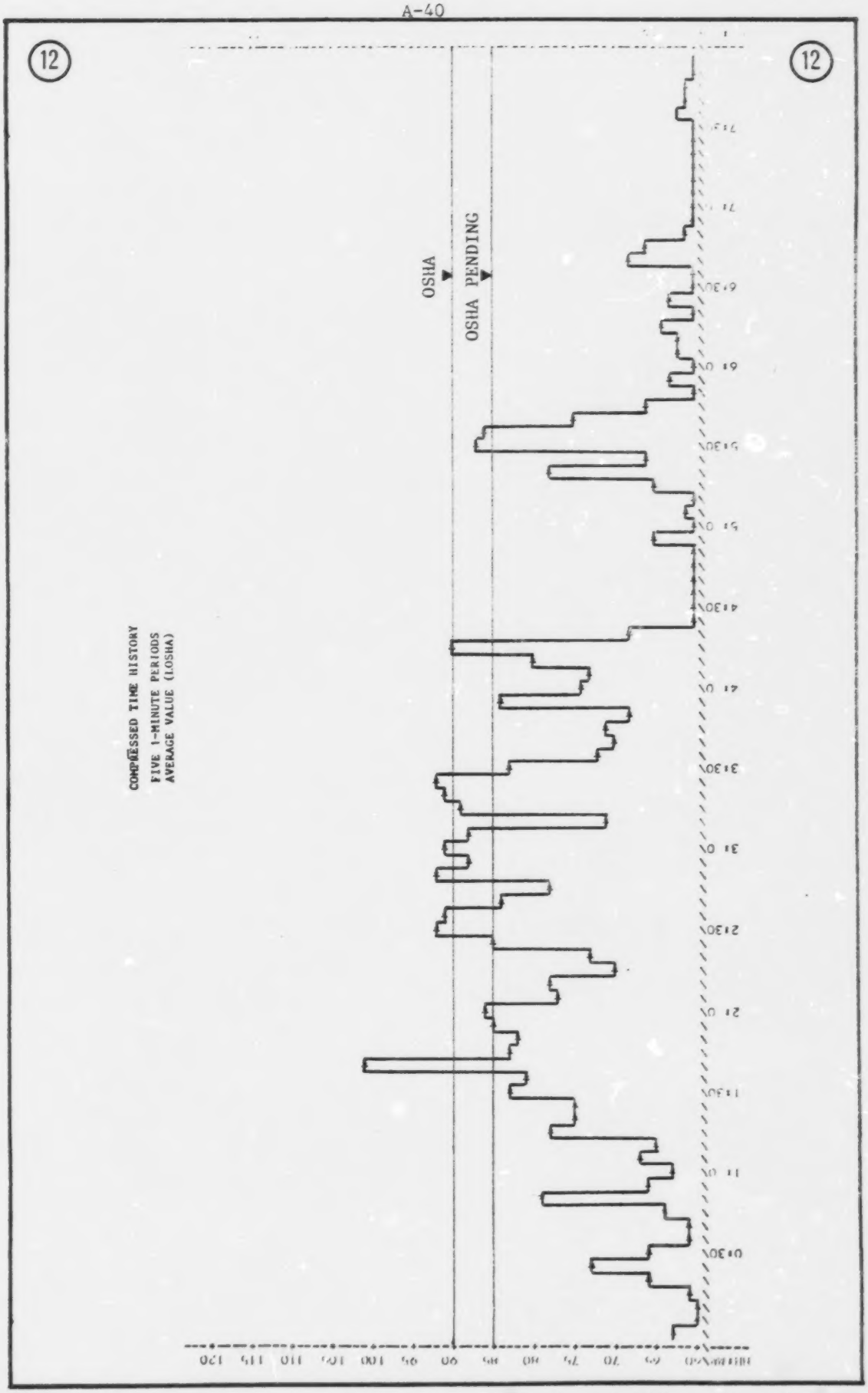
(12)

AMPLITUDE DISTRIBUTION

(12) (12)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
251	52.3	60 TO 64
55	11.5	65 TO 69
44	9.2	70 TO 74
33	6.9	75 TO 79
24	5.0	80 TO 84
27	5.6	85 TO 89
36	7.5	90 TO 94
7	1.5	95 TO 99
3	.6	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


12
12
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
DECIBELS
65
70
75
80
85
90
95
100
105
110
115
120

(13)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1216     60     64      4      1
   13203      115200    480
 60  60  61  60  60  60  60  60  60  64  60  60  60  60  60  60
 61  60  60  60  60  60  60  60  60  60  73  60  71  62  60  60
 60  60  60  60  60  60  60  60  62  60  64  72  65  67  68  60
 65  67  65  63  85  87  77  62  67  80  90  64  62  73  68  68
 73  62  [illegible]
 80  74  60  60  60  70  77  90  95  82  82  80  74  68  63  79
 74  62  61  71  83  82  83  82  80  82  82  80  91  90  90  90
 90  90  90  90  90  90  90  90  90  91  91  91  90  90  90  90
 91  93  91  90  91  92  91  91  91  91  91  91  91  91  91  84
 73  91  91  85  60  88  91  91  91  92  91  91  78  60  60  60
 60  60  60  60  79  94  91  92  82  60  60  68  81  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  79  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  80
 90  91  91  85  82  82  82  82  82  82  82  82  82  82  82  81
 82  82  82  82  82  82  82  82  82  82  82  82  82  81  82  82
 82  82  83  67  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  61
 60  69  60  60  65  83  84  83  83  84  80  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  61  60  60  60  60  60
 60  60  60  60  64  60  64  60  60  77  94  95  95  93  82  68
 61  60  60  82  84  85  84  83  83  83  84  93  96  89  84  83
 82  82  82  82  82  82  82  82  82  82  85  93  95  96  87  84
 87  91  92  91  93  95  95  93  92  92  93  94  95  94  96  97
 94  96  95  92  94  95  96  96  96  96  96  96  96  96  95  96
 97  97  98  97  97  98  98  98  98  98  98 100  99  96  96  96
 96  96  96  93  93  96  96  96  96  95  96  96  94  92  92  89
 90  89  60  60  60  85  92  86  60  62  68  60  69  65  71  82
 79  62  60  69  75  92  85  80  60  60  60  61  64  68  60  64
ECOF
```

(13)

```
ENTER LOG DATE (DD/MM/YR) : 17/08/79
ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 4805
 ENTER JOB CODE (3 CHARS) : 296
```

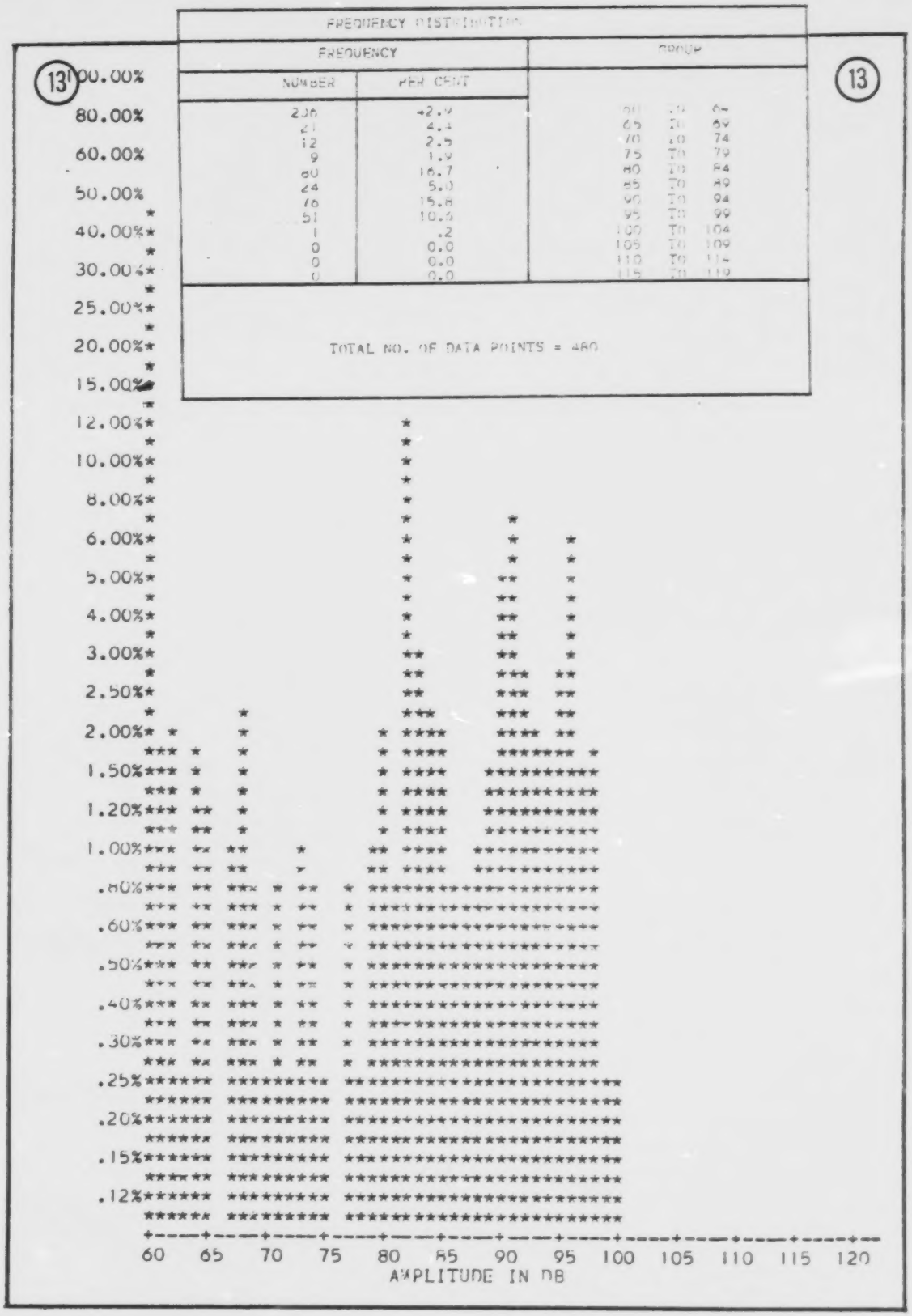
```
   DATA LOGGED :17  AUG 1979          DATA ANALYZED : 25 SEPT 1979
        LOGGER : DR-301/26                 SITE CODE : ISHAF
 SERIAL NUMBER : 1216                        JOB CODE : 296
      BASELINE : 60 DB                     USER CODE : 4805
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8 HR 0 M           STANDBY TIME =   0 HR 0 M
```

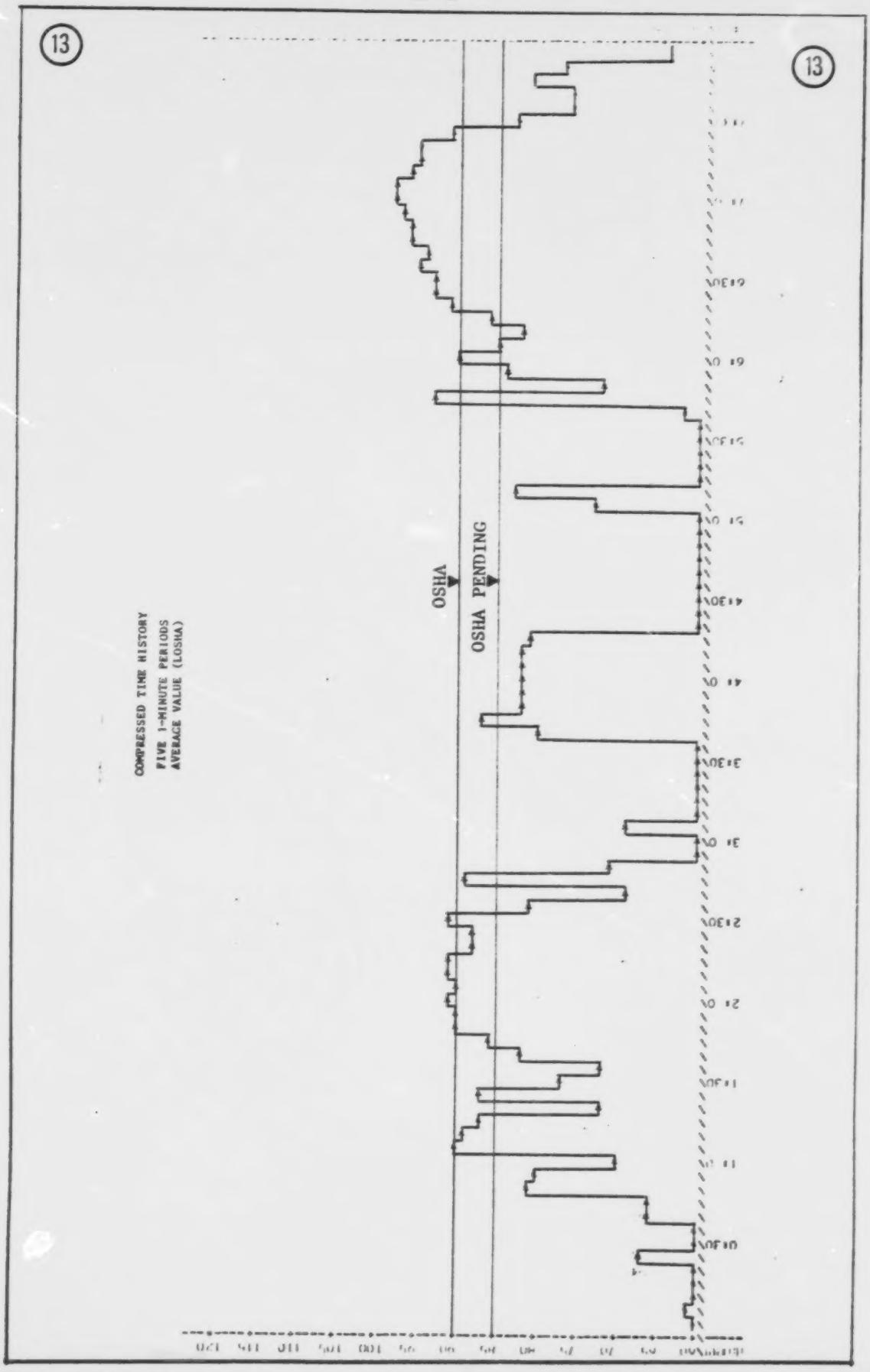
TIME HISTORY ANALYSIS

AUTO. EXPOSURE INDEX (A.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL DOSE = 90.00 % DOSE
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	DOSE		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	70.2	70.2	.803	.80
2	85.7	81.5	6.854	7.66
3	87.5	84.1	8.332	15.99
4	70.2	82.8	1.841	17.83
5	74.4	81.7	1.466	19.29
6	78.9	81.3	2.683	22.46
7	93.8	84.5	18.334	40.79
8	91.2	85.8	15.363	56.16

MIN. COMP. = 60 DB MAX. COMP. = 100 DB
ARITHMETIC MEAN = 79 DB
STD. DEVIATION = 14 DB
VARIANCE =195 DB


FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
236 42.9
21 4.4
12 2.5
9 1.9
80 16.7
24 5.0
76 15.8
51 10.6
1 .2
0 0.0
0 0.0
0 0.0
TOTAL NO. OF DATA POINTS = 480
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


13
13
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(14)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(14)

```
 1  26  80  1221    60    64     4     1
      19     115200  480
 62  60  60  67  66  66  61  60  71  73  73  64  63  64  72  63
 71  70  63  65  77  64  60  60  60  60  60  60  60  60  62  61
 60  60  60  66  60  61  65  73  61  73  83  79  88  96  84  84
 85  86  86  86  86  90  86  83  84  83  84  85  85  85  86  85
 85  86  84  83  85  84  85  84  83  84  84  85  84  85  87  90
 89  87  88  89  87  85  86  84  84  85  85  85  84  85  86  87
 87  86  87  85  86  86  87  86  85  85  86  87  87  85  85  86
 87  86  85  84  86  85  86  88  89  85  86  87  86  85  87  86
 86  86  85  85  86  84  84  85  84  85  85  84  85  83  86  85
 85  84  85  87  85  87  97  84  82  89  82  72  61  71  67  61
 60  60  67  60  60  60  60  60  60  64  60  60  60  60  60  60
 60  60  60  60  75  77  77  60  75  65  76  79  61  79  78  82
 78  80  80  83  82  78  81  89  91  81  90  82  83  91  95  91
 87  86  86  87  89  87  87  88  88  87  88  87  91  86  88  87
 86  86  86  87  87  86  85  85  86  89  97  77  81  68  64  60
 60  60  60  61  60  66  67  60  60  60  60  60  64  65  60  60
 60  61  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  61  61  62  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  62  60
 69  60  69  81  97  85  83  83  84  84  85  84  86  85  86  88
 85  84  86  85  86  85  86  84  85  84  84  85  85  84  84  85
 86  85  84  84  91  93  93  94  93  91  85  85  84  85  85  84
 84  85  86  86  92  91  93  90  93  92  94  94  94  94  94  93
 93  93  94  94  93  94  91  86  86  89  88  88  89  87  87  87
 89  88  87  88  86  87  86  89  87  87  87  88  86  85  85  85
 89  90  89  87  87  90  88  88  88  87  87  87  87  86  87  87
 85  83  83  82  83  83  83  84  84  85  84  86  85  86  85  86
 85  86  86  86  91  85  86  88  91  90  86  86  86  87  86  86
 86  86  97  84  71  65  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  61  61  61  60  60  60  61  60  60  60  60  60
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 2SSYA
ENTER USER CODE (4 CHARS) : 4800
 ENTER JOB CODE (3 CHARS) : HLA
```

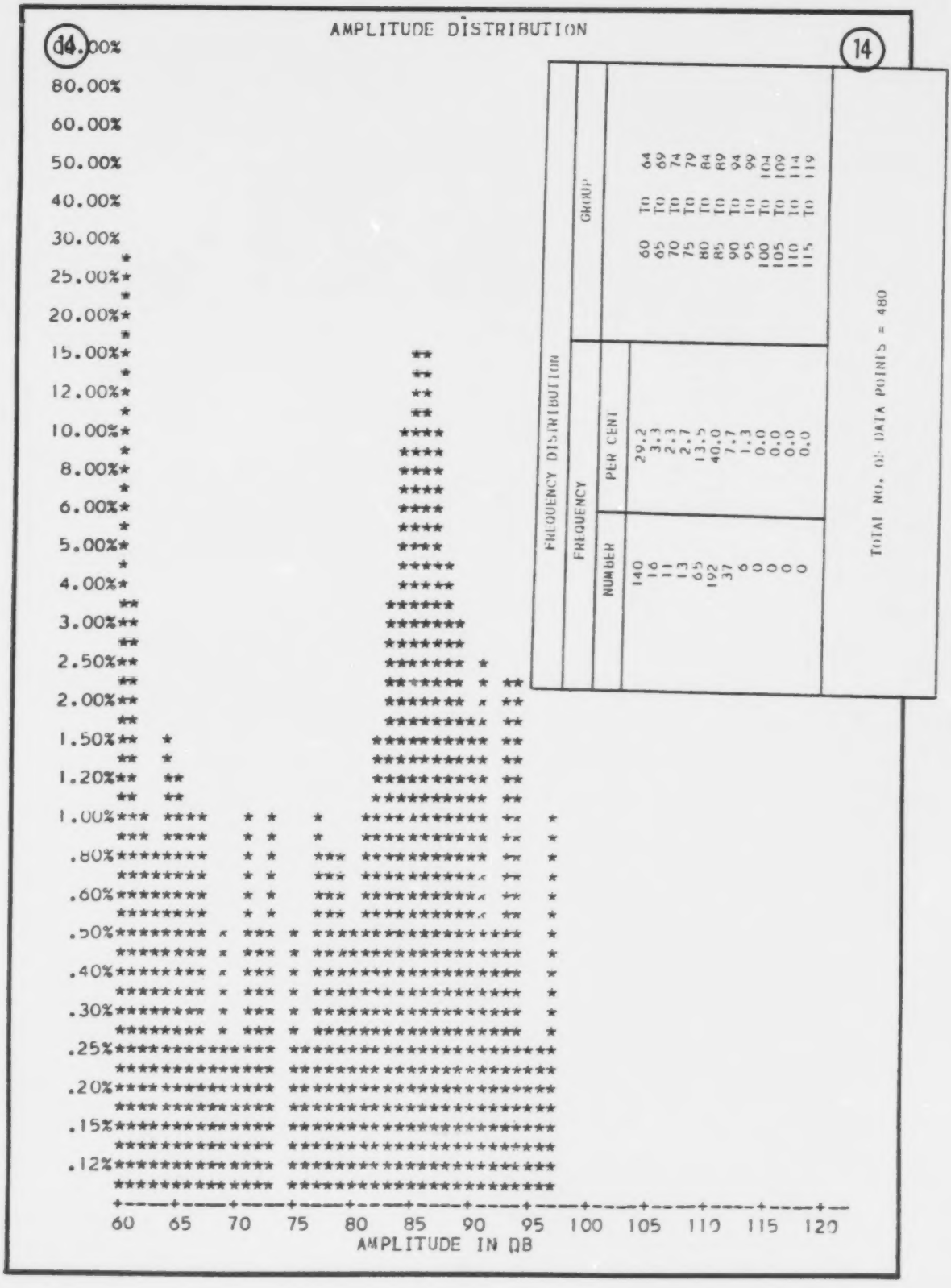
```
   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 2SSYA
SERIAL NUMBER : 1221                       JOB CODE : HLA
     BASELINE : 60 DB                     USER CODE : 4800
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0: 4
```

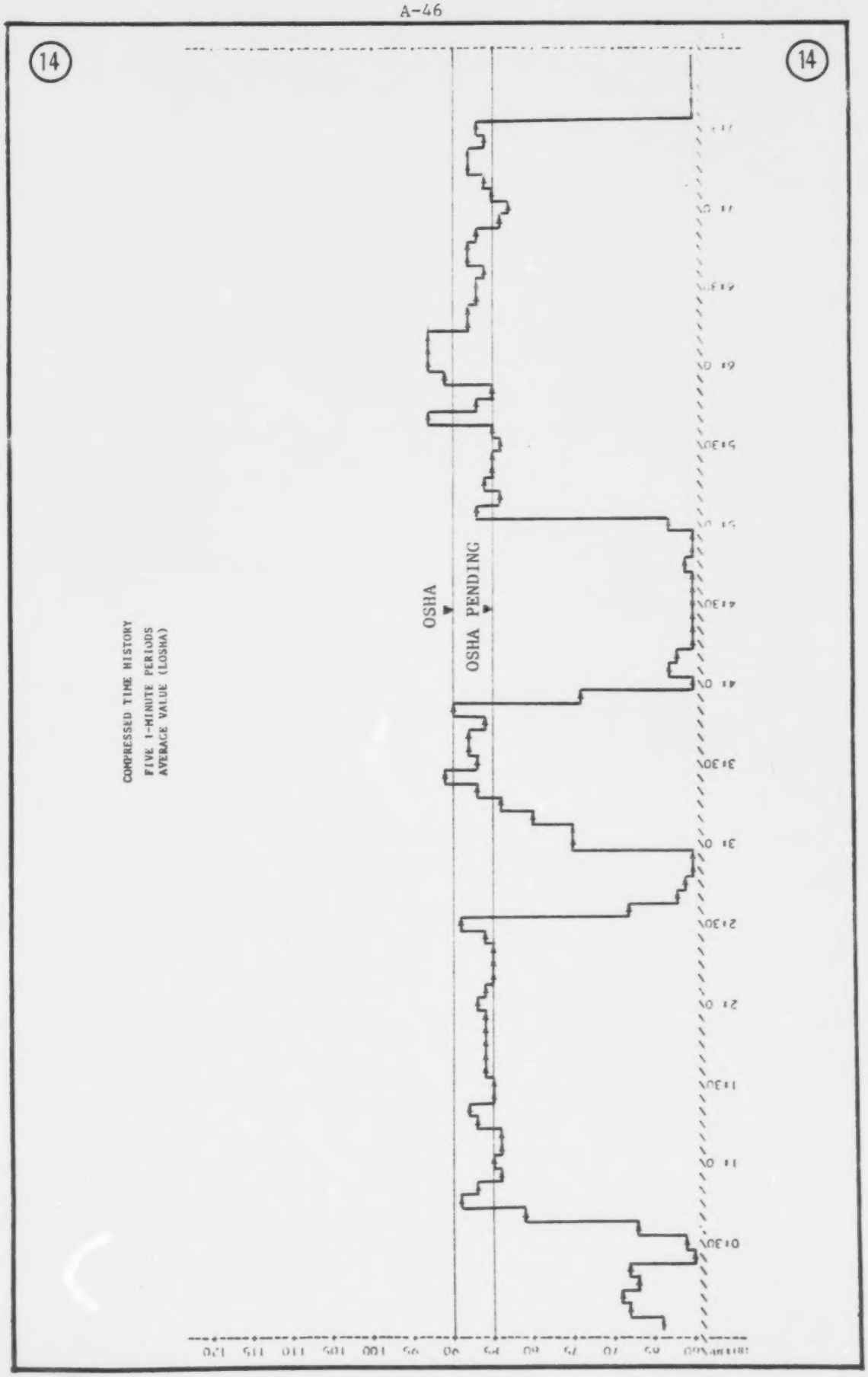
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	78.7	78.7	2.618	2.62
2	65.8	83.1	6.965	9.58
3	82.5	82.9	4.431	14.01
4	85.0	83.7	6.784	20.80
5	60.6	82.1	.214	21.01
6	86.5	83.1	7.686	28.70
7	89.3	84.4	11.361	40.06
8	82.5	84.2	4.436	44.50

MIN. COMP. = 60 DB MAX. COMP. = 97 DB
ARITHMETIC MEAN = 77 DB
STD. DEVIATION = 12 DB
VARIANCE = 144 DB


AMPLITUDE DISTRIBUTION
d4.
14
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 To 64 140 29.2
65 To 69 16 3.3
70 To 74 11 2.3
75 To 79 13 2.7
80 To 84 65 13.5
85 To 89 192 40.0
90 To 94 37 7.7
95 To 99 6 1.3
100 To 104 0 0.0
105 To 109 0 0.0
110 To 114 0 0.0
115 To 119 0 0.0
TOTAL NO. OF DATA POINTS = 480


14
14
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
65
70
75
80
85
90
95
100
105
110
115
120

(15)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

  1  26  80  1216    60    64     4     1
     244     115200  480
 60  60  60  60  60  60  60  60  62  67  62  70  60  60  76  76
 60  60  65  67  68  75  66  60  62  60  60  65  60  60  60  64
 68  76  76  73  76  92  95  83  84  84  83  82  83  83  82  83
 83  84  84  83  81  82  82  82  82  85  84  84  82  82  84  86
 85  87  86  85  85  84  87  85  85  84  84  84  84  85  85  84
 93  86  87  85  89  88  88  91  89  89  86  86  84  84  84  85
 85  84  84  85  91  86  86  86  86  84  85  84  84  84  93  83
 84  84  84  83  84  86  85  85  84  84  83  84  85  85  86  87
 90  86  84  83  84  85  85  86  84  84  84  83  82  93  80  84
 85  85  75  76  84  85  83  84  85  87  88  89  88  87  88  91
 90  86  87  85  87  87  85  86  89  90  90  91  90  92  86  85
 84  84  84  84  85  85  89  87  87  87  87  87  87  87  86  85
 85  85  87  89  90  88  89  86  87  85  85  85  86  86  86  86
 86  87  87  95  92  86  84  85  87  90  88  88  87  88  88  88
 88  90  86  88  86  87  86  86  86  87  86  93  91  84  87  81
 65  71  74  84  87  91  92  80  77  61  61  61  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 61  60  60  75  86  96  90  87  86  85  86  85  85  83  88  76
 60  60  60  73  80  72  60  61  86  87  87  87  86  86  87  87
 87  84  84  84  86  84  96  89  98  87  86  84  83  84  83  83
 84  83  82  84  83  84  86  84  85  84  84  84  84  83  82  86
 86  86  86  87  87  88  87  88  89  92  94  91  87  89  91  94
 86  86  86  86  86  86  85  89  87  86  86  88  87  87  87  88
 87  85  87  87  88  89  86  86  90  87  84  83  85  83  83  83
 85  86  86  86  86  88  90  89  87  88  90  87  89  86  86  87
 88  88  87  87  87  88  86  93  94  88  98  86  88  87  86  87
 87  87  87  86  87  86  87  87  87  89  87  86  90  91  89  87
 85  85  87  87  87  87  95  83  67  61  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  61  60  60  60  60  63
%EOF


ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 2SSYA

ENTER USER CODE (4 CHARS) : 4813
 ENTER JOB CODE (3 CHARS) : 4LA

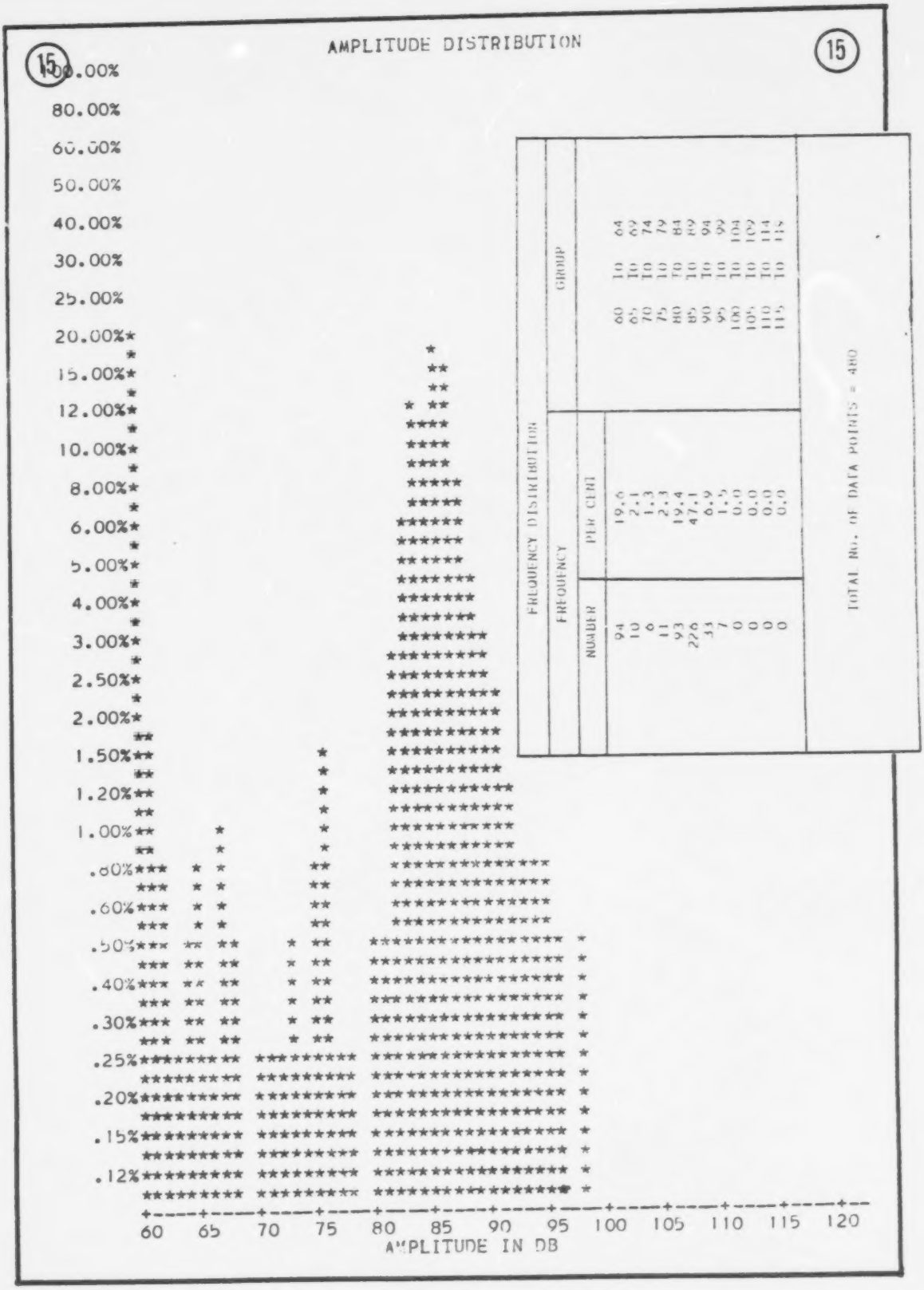

   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : 2SSYA
SERIAL NUMBER : 1216                       JOB CODE : 4LA
    BASELINE : 60 DB                     USER CODE : 4813
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0            STANDBY TIME =   0: 1: 1

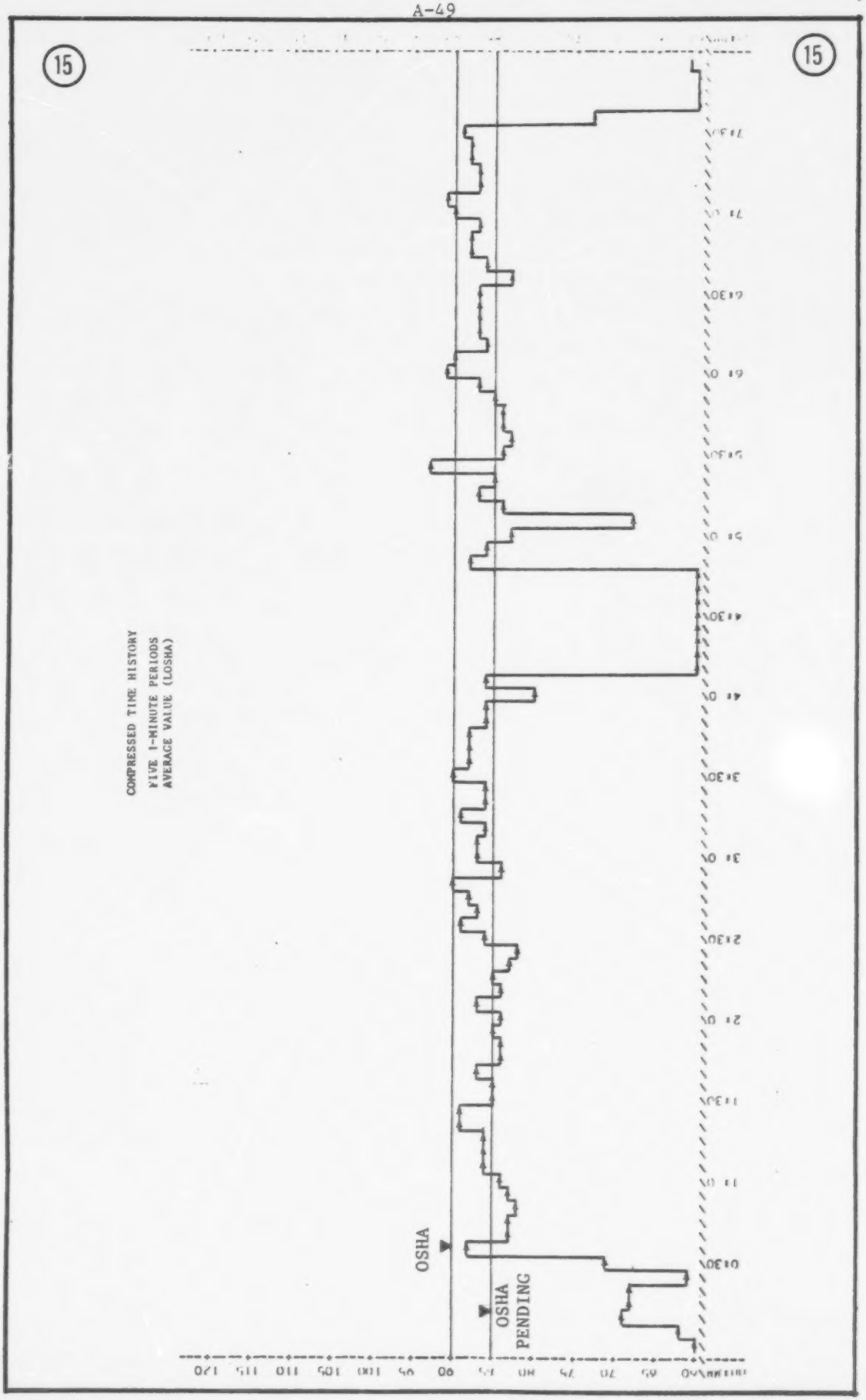
          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                      NOISE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1        79.0        79.0        2.719        2.72
   2        86.0        83.3        7.191        9.91
   3        86.1        84.4        7.290       17.20
   4        87.3        85.2        8.556       25.76
   5        78.2        84.3        2.429       28.19
   6        85.4        84.5        6.629       34.82
   7        87.6        85.0        8.759       43.77
   8        85.1        85.0        6.339       50.11
MIN. COMP. =  60 DB              MAX. COMP. =  98 DB
ARITHMETIC MEAN =  80 DB
STD. DEVIATION =  11 DB
VARIANCE =121 DB
```

(15)


AMPLITUDE DISTRIBUTION
15
15
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 94 19.6
65 TO 69 10 2.1
70 TO 74 6 1.3
75 TO 79 11 2.3
80 TO 84 93 19.4
85 TO 89 226 47.1
90 TO 94 33 6.9
95 TO 99 7 1.5
100 TO 104 0 0.0
105 TO 109 0 0.0
110 TO 114 0 0.0
115 TO 119 0 0.0
TOTAL NO. OF DATA POINTS = 480


15
15
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
90
95
100
105
110
115
120

(16)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1218    60    64     4     1
      53      115200  480
 69  65  69  60  66  63  61  61  64  62  67  63  61  71  62  65
 70  61  72  67  66  63  62  75  73  61  60  60  61  61  60  60
 60  64  60  62  66  71  60  60  63  60  61  64  74  71  70  70
 84  90  88  90  60  75  82  84  87  85  86  85  85  88  86  82
 88  96  89 100 101 100  84  83  85  90  86  82  92  92  94 102
102 102 103 103 103 103 103 101 102 103 104 105 100 105 101  95
 98 102 101 101 100  99 101 101 100 103  94  96  97  96 100 100
101  93  60  60  60  61  60  60  60  80  98  99 102  96 100 100
100  98 116 100  98  90  86  60  80  88  94  98 102  92  60  60
 60  60  60  60  65  60  60  75  64  65  95 100  87  70  64  62
 60  62  65  61  61  65  63  74  61  65  72  75  86  62  60  60
 60  65  60  84  80  72  60  78  97  99  94 101  86  86  84  86
 85  85  85  85  86  87  88  87  84  87  86  84  85  83  84  88
 89  91  83  83  83  83  84  83  83  83  84  84  83  83  83  83
 85  85  85  84  85  84  84  84  82  81  84  83  86  82  84  85
 84  84  85  85  84  86  85  88  83  80  82  88  82  84  85  83
 85  87  88  93  60  67  60  60  94  98  84  99  97  87  87  94
 99  87 100  99 100  98 100  99  97  83  84  92  93  99  98 100
 99  95  97  95  95  98 100 100  98  93  93 100  97  61  69  60
 60  60  64  60  60  60  60  60  66  60  61  62  60  60  60  60
 60  60  60  72  68  77  63  66  82  97 100  97  87  94  97  78
 90  98 101  97 101 101 103 103 101 103 103  99 102 100 101  97
 80  69  67  79  87  87  80  76  60  61  85  78  85  89  85  66
 67  65  60  82  96 101 102 102 102 101 101 100 101 102 103 102
102 101 101 100  98  87  89  87  97  78  89  91  80  82  84  83
 84  84  95  85  82  94  78  70  80  77  80  95  60  62  94  86
 78  67  66  85  95  89  93  96 100 100  91  67  63  82  99 100
 91  80  86  88  92  85  87  87  86  82  84  74  61  61  62  61
 86  93  85  89  86  73  78  80  90  87  89  86  85  85  84  60
 61  60  95 100  91  82 102 101 100 104 105 103 105 103 102 101
%EOF


ENTER LOG DATE (DD/MM/YR) : 26/07/79
ENTER SITE CODE (5 CHARS) : 2SHAF
ENTER USER CODE (4 CHARS) : 4682
 ENTER JOB CODE (3 CHARS) : 242


   DATA LOGGED :26 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 2SHAF
SERIAL NUMBER : 1218                       JOB CODE : 242
     BASELINE : 60 DB                     USER CODE : 4682
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:13

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

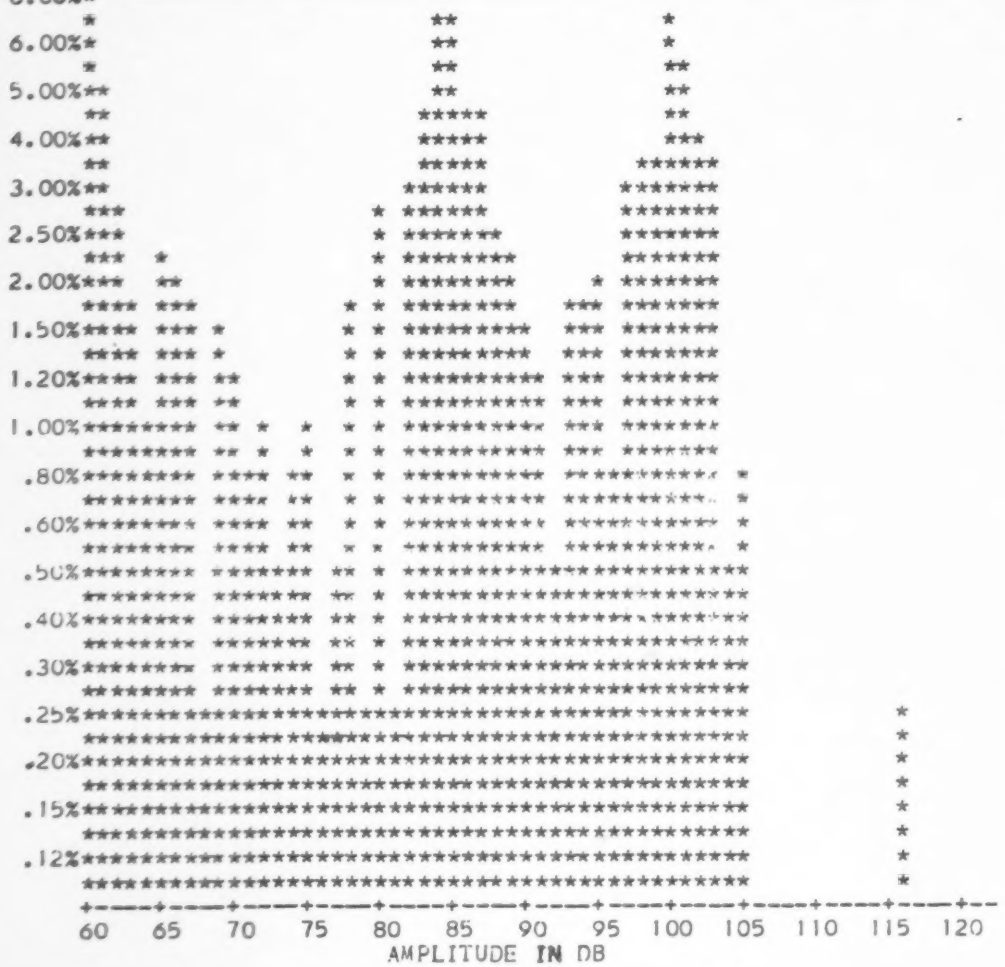
TIME          LOSHA                      %DOSE
HOUR     CURRENT  CUMULATIVE       CURRENT  CUMULATIVE
   1        75.6       75.6         1.686       1.69
   2        98.3       93.6        39.691      41.38
   3        93.6       93.6        20.476      61.85
   4        86.8       92.4         8.018      69.87
   5        93.8       92.7        21.159      91.03
   6        93.0       92.8        19.077     110.11
   7        93.8       92.9        21.163     131.27
   8        94.1       93.1        22.203     153.47
MIN. COMP. =  60 DB                MAX. COMP. = 116 DB
ARITHMETIC MEAN =  92 DB
STD. DEVIATION =  15 DB
VARIANCE =225 DB
```

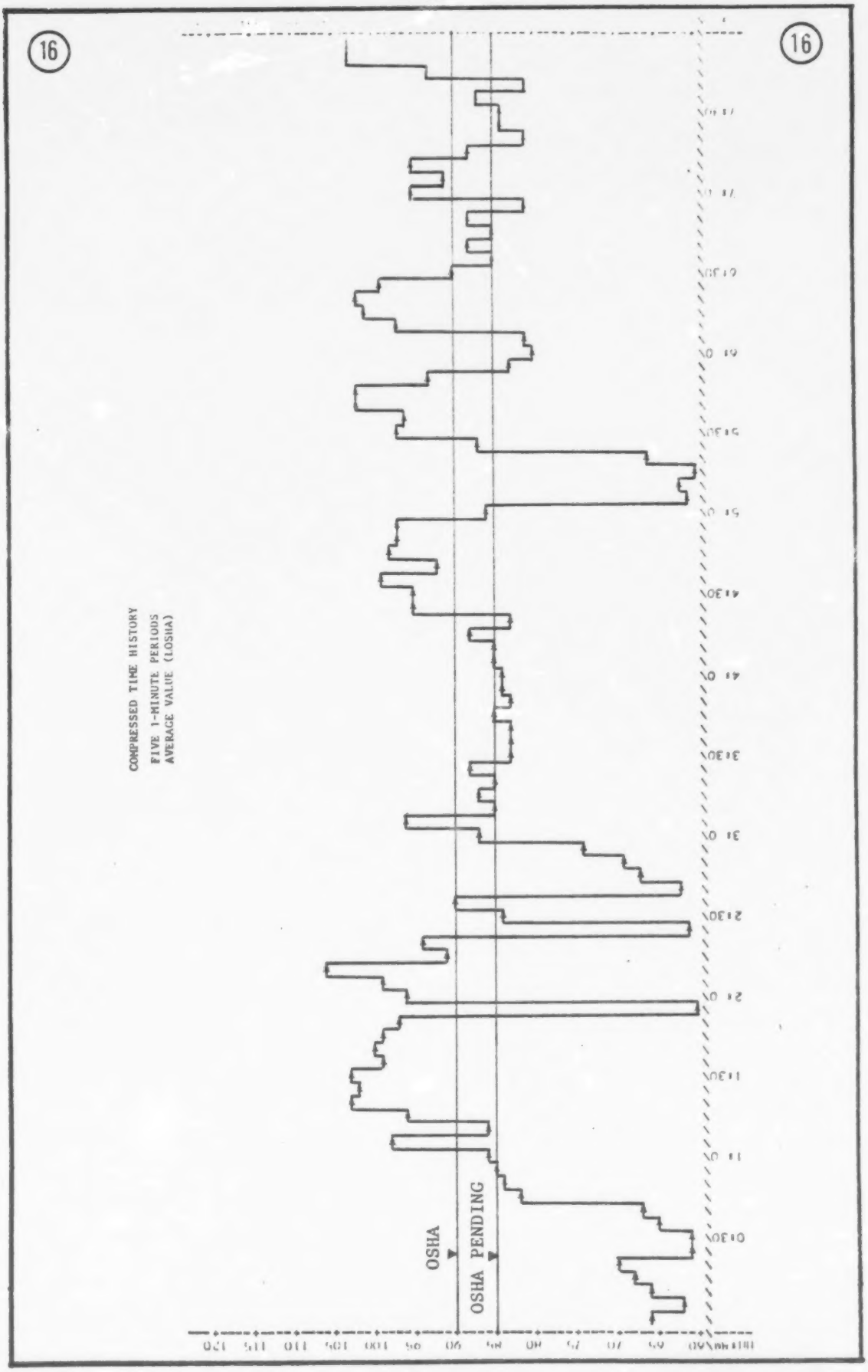
(16)

AMPLITUDE DISTRIBUTION

(16) (16)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
97	20.2	60 TO 64
31	6.5	65 TO 69
17	3.5	70 TO 74
15	3.1	75 TO 79
71	14.8	80 TO 84
82	17.1	85 TO 89
27	5.6	90 TO 94
53	11.0	95 TO 99
83	17.3	100 TO 104
3	.6	105 TO 109
0	0.0	110 TO 114
1	.2	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




16
16
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(17)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"/RA
  1  26  40  1219    60    64     4     1
      68     1152.00   480
 71  61  66  60  60  60  61  65  79  92  70  76  90  90  93  93
 94  94  96 100  98  97  95  95  97  93  97  89  72  74  66  68
 63  60  60  63  60  60  60  60  66  77  66  96  70  69  76  81
 74  71  90  90  90  72  86  93  97  93  91  89  89  79  88  86
 87  86  80  89  82  89  89  86  89  88  89  85  89  89  82  89
 74  82   4  81  84  84  84  84  87  84  81   1  85   4  84  84
 83  83  89  89  81  92  93  93  76  80  82  90  81  74  81  71
 79  72  77  77  79  77  75  81  81  84  77  84  84  84  77  77
 80  82  86  84  83  80  81  90  99 100 100 100 100  96  91  96  99
 88  86  87  77  87 127  92 111 113 100 102  84  83  77   1  83
 81  81  96 101 100 100  92  96  81  72  76  80  89  79  73  73  71
 91  95  96  99  98  98  97  97  98  95  91  86  97  98  94  82
 90  97  91  89  82  71   1  96  92  97  95  87  92  83  82  79
 91  87  80  80  80  80  88  97  73  72  92  91  92  73  69  97
 72  72  76  69  75  73  80  72  66  64  73  62  58  60  60  60
 90  92  80  70  60  87  93 100  97  94  91  86  85  95  90  95
 87  98  72  64  60  61  85  64  60  62  60  60  64  54  72  72
 71  60  60  60  63  60  60  60  62  60  60  60  60  60  61  61
 60  60  86  96  80  74  91  73  60  60  74  80  80  62  85  80
 89  90  85  96  90  86  75  61  61  62  80  83  98  98  83  94
 96  97  96  96  96  87  91  83  87  84  85  86  86  96  92  93
 94  92  95  92  92  91  89  95  89  93  89  91  94  92  95  94
 94  90  93  85  86  85  85  85  87  92  92  89  86  86  95  91
 87  89  92  85  84  85  84  86  84  90  91  94  93  91  87  94
 88  84  84  84  87  95  84  87  85  93  92  74  60  60  63  62
 60  60  60  60  62  60  60  60  60  60  60  60  60  60  61  60
 60  60  60  60  60  74  60  60  60  60  60  65  86  84  79  78
 60  60  70  73  81  60  75  68  75  60  75  91  74  95  80  60
 62  60  69  69  60  65  60  60  60  60  65  64  75  71  91  93
100 102  93  91 103  99  97  98  84  91  88 101 103 104  96  90
.EOF
```

(17)

```
ENTER LOG DATE (DD/MM/YR) : 17/07/79 .
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4803
 ENTER JOB CODE (3 CHARS) : 296
```

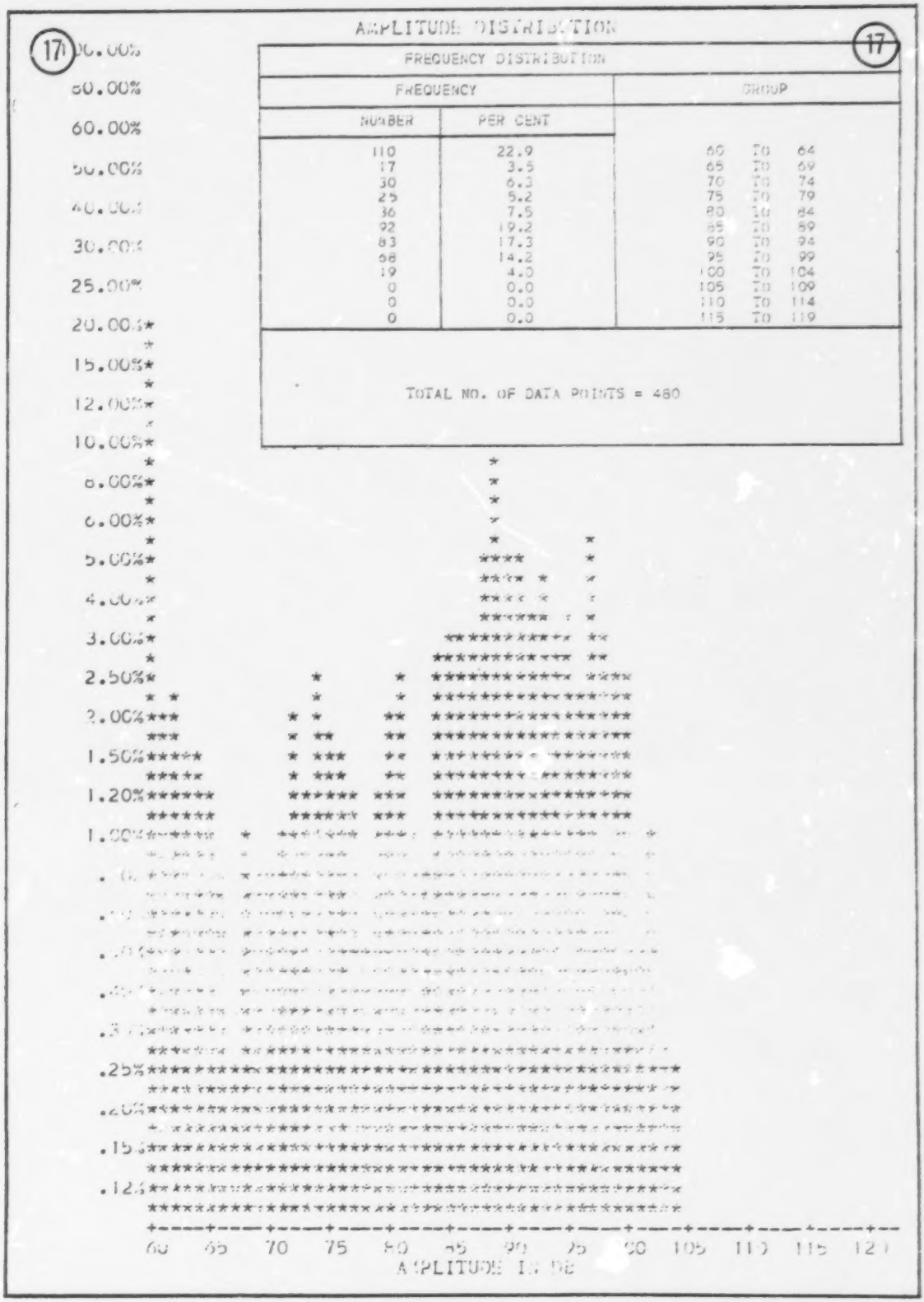
```
    DATA LOGGED :17 JULY 1979          DATA ANALYZED : 13 SEPT 1979
        LOGGER : TL-30/725                 SITE CODE : CC210
 SERIAL NUMBER : 1219                      JOB CODE : 296
       RESOLN. : 1.0 DB                    USER CODE : 4803
 DYNAMIC RANGE : 60 DB                     THRESHOLD :  60.0
 SAMPLING RATE : 4/SEC                   TOTAL SAMPLES =  1152.00
 TEST DURATION =  48 HRS                   SAMPLE TIME =  1 1817
```

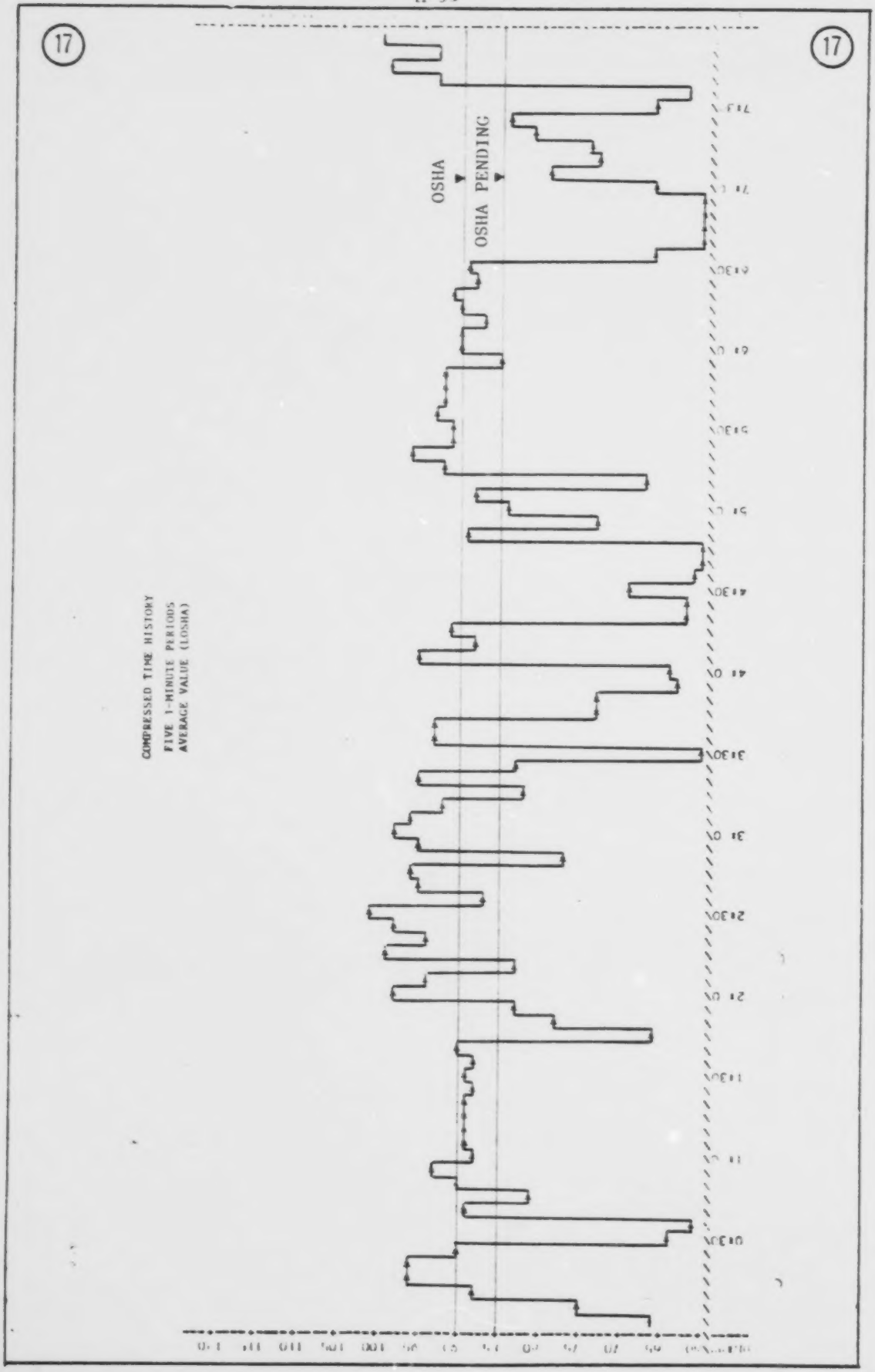
TIME HISTORY ANALYSIS

1991 ENVIRONMENTAL NOISE INDEX (E.N.I.) CALCULATIONS
USE VALUES OF THE FOLLOWING:
TOD = 70 % / 7 DAYS
DAYTIME (0700 TO 2200) LEVEL = 5 DB
NIGHTTIME (2200 TO 0700) LEVEL = 10 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LOCAL CURRENT	LOCAL CUMULATIVE	SOUND CURRENT	SOUND CUMULATIVE
1	89.0	89.0	10.830	10.83
2	87.3	88.2	8.597	19.43
3	90.3	91.4	26.179	45.61
4	90.3	91.1	12.983	58.59
5	83.9	90.2	5.377	63.97
6	90.1	90.3	13.681	77.65
7	85.7	89.8	6.874	84.52
8	90.1	89.8	12.661	97.18

MIN. COMP. = 60 DB MAX. COMP. = 104 DB
ARITHMETIC MEAN = 91 DB
STD. DEVIATION = 14.00
VARIANCE =196 DB


AMPLITUDE DISTRIBUTION
17
17
FREQUENCY DISTRIBUTION
FREQUENCY
GROUP
NUMBER
PER CENT
110 22.9 60 TO 64
17 3.5 65 TO 69
30 6.3 70 TO 74
25 5.2 75 TO 79
36 7.5 80 TO 84
92 19.2 85 TO 89
83 17.3 90 TO 94
68 14.2 95 TO 99
19 4.0 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


17
17
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(18)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  20  80  1225   60   64    4    1
      64    115200  480
  60  61  63  60  60  60  60  60  61  70  77  67  69  81  84  84
  84  84  84  84  84  85  84  86  85  85  86  85  84  90  86  85
  85  86  86  86  86  86  85  87  90  93  84  84  87  78  80  71
  64  60  60  84  82  84  65  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  83  87  85  83  79  81  81
  83  82  85  88  84  88 102 106 105  97 101  93 103  99 104  94
 101 105 112 106 103 102  97  97  97  97  97 102 106 106 103 104
 101 102 102 103 101 104 103 104 103 104 105 105 106 107 104 104
  99  81  84  89  60  60  61  80  86  60  60  60  64  81  60  63
  61  62  62  63  67  60  74  68  85  80  83  89  83  92  88  90
  89  86  89  87  91  84  82  91  90  88  85  86  89  92  90  88
  69  85  88  60  60  88  60  60  60  74  89  90  86  82  82  83
  83  83  84  83  83  85  90  84  60  60  61  63  60  60  60  60
  60  60  61  67  64  60  60  60  74  60  72  60  72  81  73  60
  60  61  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  78  79  60  60  60  60  60  60  60  61  60
  60  60  60  60  60  60  60  60  89  83  89  94  83  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  64  60  60  70  60  60  60
  60  60  60  62  63  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  73  72  60  60  60  60  60
  60  60  60  60  60  60  60  73  60  60  60  60  60  60  60  60
  62  67  60  60  64  61  82  86  90  88  83  88  85  90  86  88
  89  86  89  87  80  69  84  90  60  79  70  86  75  65  60  75
  60  60  60  60  60  60  60  60  60  74  62  63  63  60  60  60
  60  60  60  61  60  60  62  60  61  60  62  73  79  72  63  62
  66  60  68  74  68  71  76  68  60  67  61  60  61  63  65  66
%EOF
```

(18)

```
ENTER LOG DATE (DD/MM/YR) : 24/07/79
ENTER SITE CODE (5 CHARS) : 28104

ENTER USER CODE (4 CHARS) : 4722

 ENTER JOB CODE (3 CHARS) : 242
```

```
   DATA LOGGED :26 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                  SITE CODE : 28104
SERIAL NUMBER : 1225                       JOB CODE : 242
      BASELINE : 60 DB                     USER CODE : 4722
DYNAMIC RANGE : 54 DB                      THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:16
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 9  DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

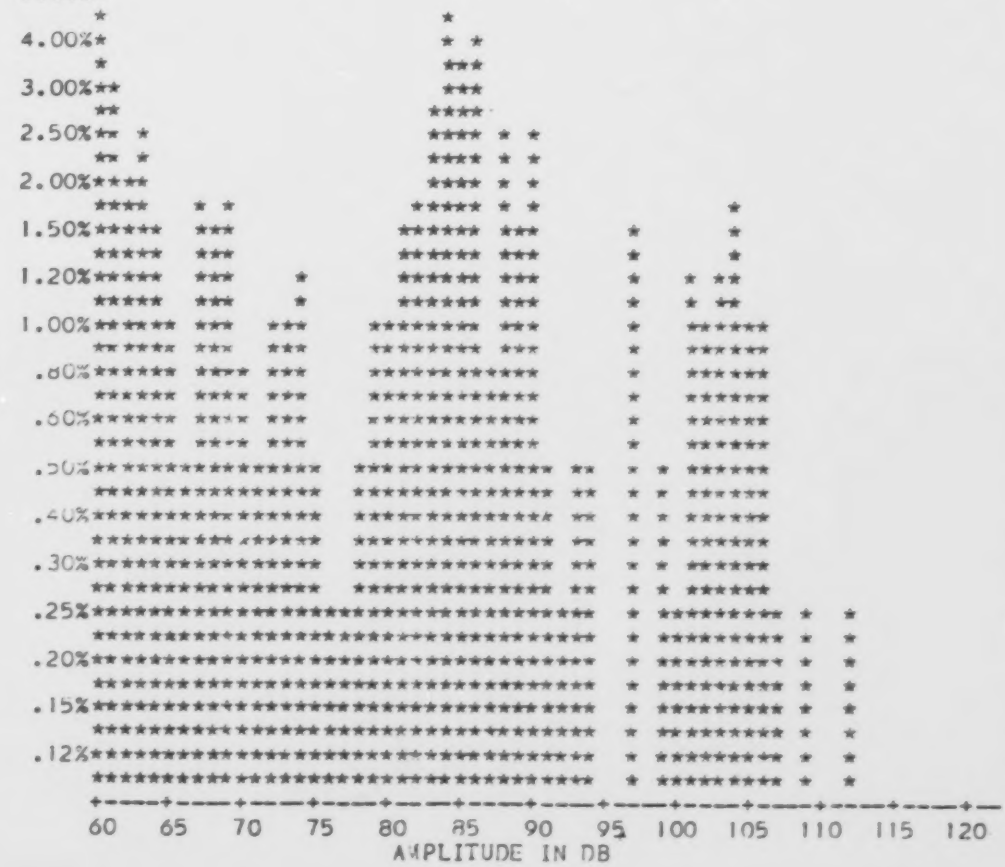
TIME		dBA		dBC	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	82.0	82.0	4.113	4.11
2	94.9	91.0	24.513	28.63
3	97.4	93.8	34.770	63.40
4	81.2	92.1	3.678	67.07
5	71.0	90.6	.899	67.97
6	80.5	89.3	.210	68.18
7	76.4	88.4	1.908	70.09
8	71.5	87.5	.951	71.05

```
MIN. COMP. =  60 DB                MAX. COMP. = 112 DB
ARITHMETIC MEAN =  70 DB
STD. DEVIATION =  14 DB
VARIANCE =196 DB
```

AMPLITUDE DISTRIBUTION

(18) (18)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
274	57.1	60 TO 64
26	5.4	65 TO 69
18	3.8	70 TO 74
10	2.1	75 TO 79
45	9.4	80 TO 84
49	10.2	85 TO 89
17	3.5	90 TO 94
8	1.7	95 TO 99
22	4.6	100 TO 104
10	2.1	105 TO 109
1	.2	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		



(19)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214    60    64     4     1
      112      115200   480
  65  63  63  60  62  60  62  62  66  62  71  61  62  69  60  66
  63  60  60  67  60  64  62  75  99  96  85  83  84  86  87  93
  99  91  83  64  91  97  98  93  87  96  94  89  74  93  80  89
  97  95  93  87  93  94  85  79  96  95  93  96  91  93  92  95
  69  71  81  69  74  60  61  65  60  60  63  60  60  68  61  71
  69  73  71  70  61  72  61  71  62  74  69  65  63  61  68  80
  67  67  61  69  60  62  62  65  64  73  68  68  75  71  76  64
  69  72  65  67  67  65  62  72  69  67  66  74  66  66  66  60
  60  66  60  60  72  78  69  73  72  64  74  65  68  64  70  70
  69  72  63  74  72  61  61  60  70  66  63  60  79  71  60  67
  61  61  60  62  61  60  60  67  79  78  60  65  63  77  69  80
  69  76  60  64  64  76  64  71  73  71  76  75  65  67  60  62
  60  72  65  61  61  62  65  66  62  60  60  71  60  63  66  66
  73  66  66  65  69  61  75  66  64  74  72  72  75  70  60  62
  63  61  65  63  63  62  68  66  73  75  73  66  69  62  64  83
  63  68  64  66  72  62  61  66  71  74  76  95 103  94  77  65
  63  60  64  65  60  62  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  62  60  62  60  77  60  65  83  95
  82  78  75  73  70  72  69  60  60  60  60  68  60  62  71  60
  60  69  60  70  60  62  79  65  70  76  60  80  71  73  60  60
  60  60  70  85 109 111 112 101 103 101  92  70  77 111  97 107
 106 108 111 108 109 108  83 100 105  94  87 100  98 100 110 115
 103 109 113 112 104 111 110  75  81  81  72  76  95 100  99 103
 103  93 111 105 105 109 114 112 114 109 111 101 113 104  67  78
  91  85 106 102 111 114 112 111 110  77  82  80  74  75  65 103
 112  70  83  72  88  60  60  67  61  70  79  62  66 100  96 100
  99 111 115 109 109 111 110 108 114 103  98 101  99 112  82  85
  94 108 110 111 108 108 111 107  94  80  66  67  66  64  67  70
  61  63  61  64  60  60  60  64  62  60  61  60  76  93  97  96
  95  97  92 101  96  94  97  87  79  60  65  60  60  60  60  60
EOF


ENTER LOG DATE (DD/MM/YR) : 13/08/79
ENTER SITE CODE (5 CHARS) : 32950

ENTER USER CODE (4 CHARS) : 4801
 ENTER JOB CODE (3 CHARS) : MLA

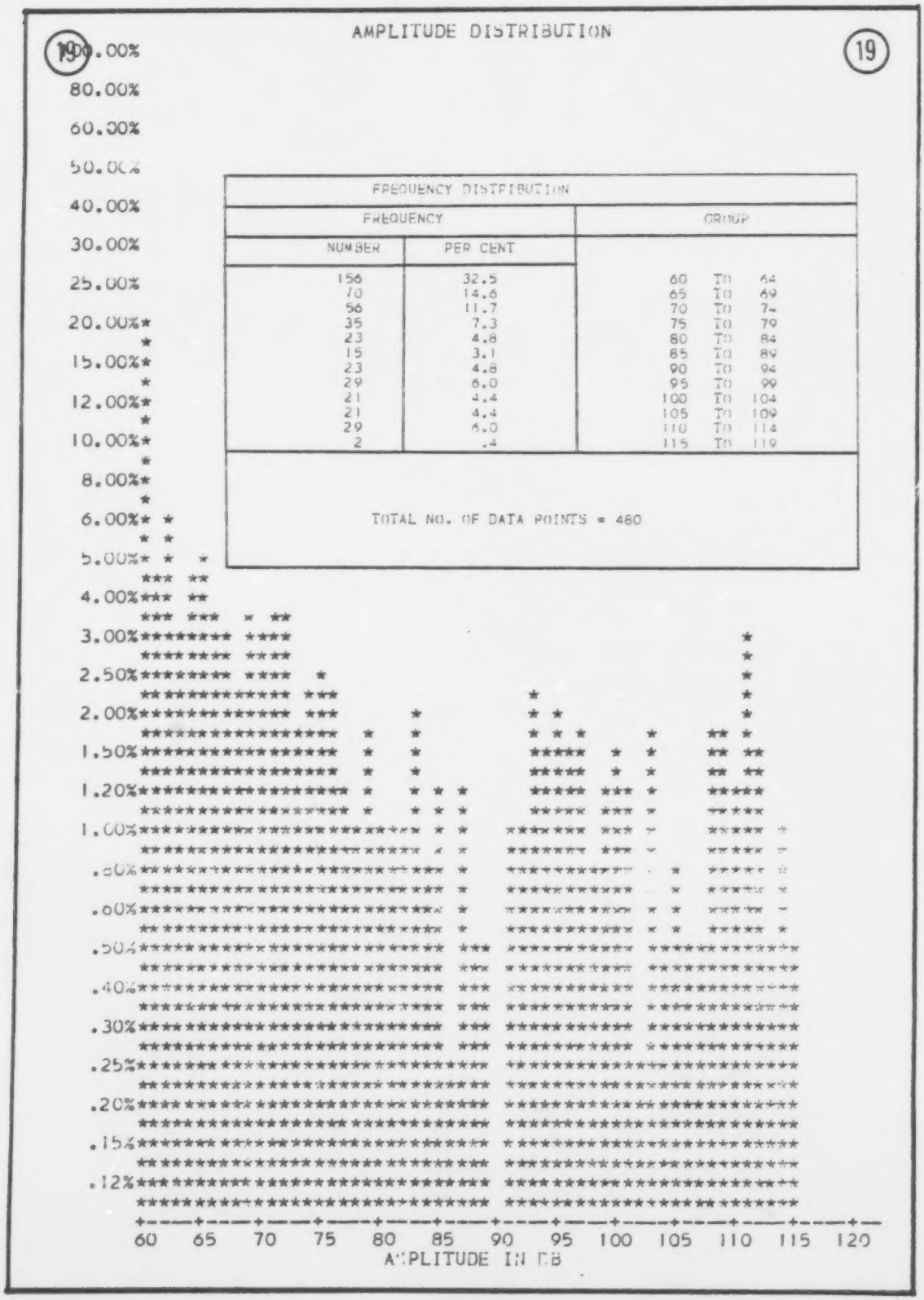

   DATA LOGGED :13  AUG 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 32950
SERIAL NUMBER : 1214                       JOB CODE : MLA
     BASELINE : 60 DB                     USER CODE : 4801
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE : 4/SEC                  TOTAL SAMPLES =  115200
 TEST DURATION =  8 HR 0 M             STANDBY TIME =   0 HRS M

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON 80 DB POLLUTION
TOTAL AIR = 80 DB / 8 HRS
EACH 3Z (DOUBLE) STEP = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LEVELS                    NOISE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1      89.3      89.3         11.293      11.29
   2      77.0      85.5          2.064      13.36
   3      70.3      83.0           .814      14.17
   4      69.7      81.3           .749      14.92
   5      79.4      80.9          2.862      17.78
   6     103.0      91.6         75.507      91.29
   7     104.4      95.4         92.341     183.63
   8     100.5      98.3         93.490     277.12
MIN. COMP. =  80 DB              MAX. COMP. =  119 DB
ARITHMETIC MEAN =  76 DB
STD. DEVIATION =   7 DB
VARIANCE =249 DB
```

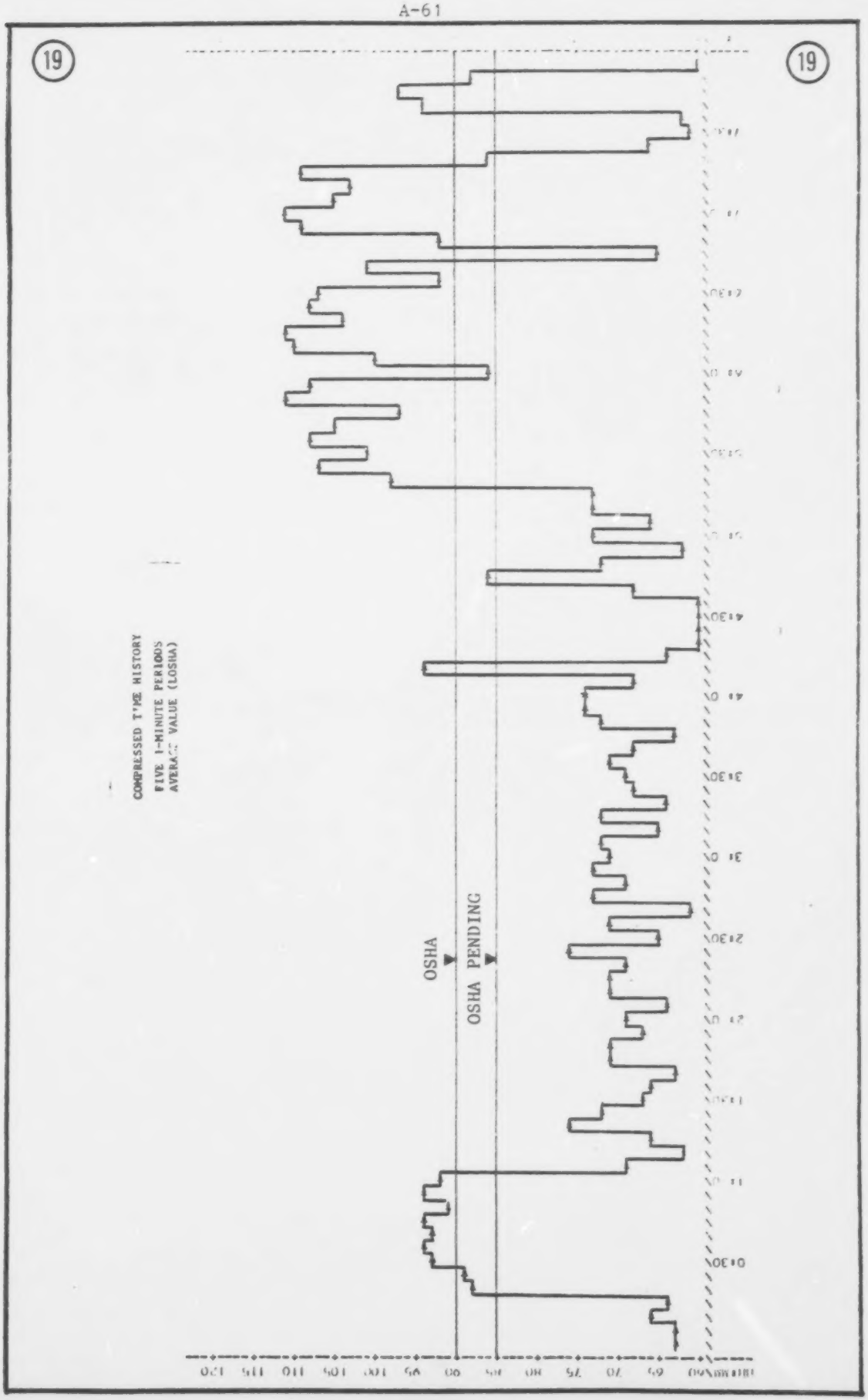
(19)



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
156	32.5	60 TO 64
70	14.6	65 TO 69
56	11.7	70 TO 74
35	7.3	75 TO 79
23	4.8	80 TO 84
15	3.1	85 TO 89
23	4.8	90 TO 94
29	6.0	95 TO 99
21	4.4	100 TO 104
21	4.4	105 TO 109
29	6.0	110 TO 114
2	.4	115 TO 119

TOTAL NO. OF DATA POINTS = 480


19
19
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:30
2:30
3:30
4:30
5:30
6:30
7:30
8:30
9:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
21:30
22:30
23:30
24:30
25:30
26:30
27:30
28:30
29:30
30:30
31:30
32:30
33:30
34:30
35:30
36:30
37:30
38:30
39:30
40:30
41:30
42:30
43:30
44:30
45:30
46:30
47:30
48:30
49:30
50:30
51:30
52:30
53:30
54:30
55:30
56:30
57:30
58:30
59:30
60:30
65
70
75
80
85
90
95
100
105
110
115
120

20

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225    60    64     4     1
     102     115200   480
```

60	60	60	60	60	60	60	60	60	60	62	60	60	60	60	66
60	60	60	65	60	61	60	60	64	60	60	63	61	60	60	61
70	67	65	60	66	60	60	60	60	60	70	69	61	64	67	65
72	65	62	60	60	70	64	61	72	82	71	60	60	64	63	67
60	60	60	60	60	60	60	60	64	79	78	72	63	67	60	61
60	60	60	60	61	61	64	64	60	64	73	66	65	69	65	64
63	64	63	60	63	64	69	61	66	66	61	63	61	63	76	70
61	61	65	60	60	60	61	61	73	65	61	73	62	61	62	61
96	93	92	96	104	85	82	72	79	75	66	60	60	60	63	61
60	60	60	60	60	60	64	62	60	60	60	60	64	65	62	60
60	60	60	60	61	60	62	62	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	61	73	60	60	60	60	64	60	60
60	60	60	60	60	60	60	60	63	60	63	60	60	60	60	61
60	74	87	77	82	65	73	64	79	80	63	60	60	62	70	68
62	60	60	60	61	60	60	60	62	60	60	68	60	60	60	60
60	60	72	60	79	77	66	74	63	66	65	62	61	60	60	60
60	60	60	60	60	60	60	60	60	60	60	63	60	60	60	60
60	60	60	60	65	60	60	60	60	62	60	60	60	60	60	60
60	60	60	63	65	60	60	60	62	60	61	63	60	60	60	60
60	60	62	64	60	66	63	67	60	60	70	74	68	67	67	72
62	65	60	61	60	60	61	60	60	60	60	60	60	60	60	60
60	60	60	60	72	60	67	60	60	60	60	60	64	65	83	81
71	62	71	61	64	60	60	62	60	60	64	60	64	67	65	60
64	62	61	60	62	60	77	86	60	83	79	62	64	95	96	95
93	84	73	74	70	76	63	66	66	73	77	78	70	76	72	68
67	68	60	62	69	65	71	66	62	64	60	64	62	60	61	65
62	60	65	62	60	68	67	60	87	97	89	72	82	78	75	84
75	75	75	80	66	68	82	70	72	83	76	83	102	103	100	95
82	85	86	87	86	87	87	87	87	88	87	87	80	89	67	64
62	66	67	69	82	76	67	60	61	72	82	77	70	72	94	63

```
END
```

```
ENTER LOG DATE (DD/MM/YR) : 24/08/79
ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 4808
 ENTER JOB CODE (3 CHARS) : 296
```

```
    DATA LOGGED :24  AUG 1979
         LOGGER : DB-301/20
SERIAL NUMBER : 1225
       BASELINE : 60 DB
 D/A IC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =    8: 0: 0

DATA ANALYZED : 25 SEPT 1979
    SITE CODE : 00000
     JOB CODE : 296
    USER CODE : 4808
   TAPE SERIAL : 1225
TOTAL SAMPLES =  115200
STANDARD TIME =    8: 0: 0
```

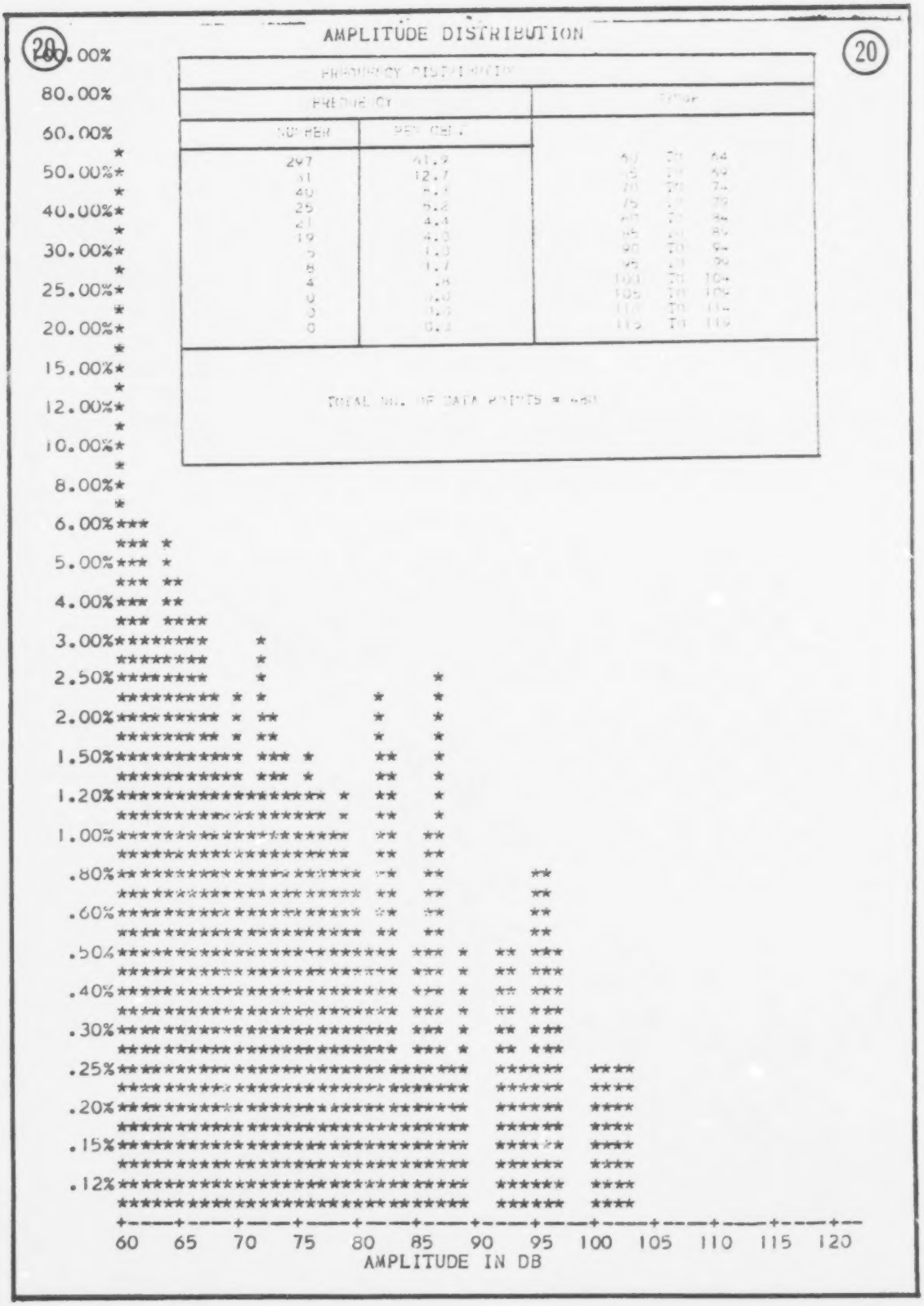
TIME HISTORY ANALYSIS

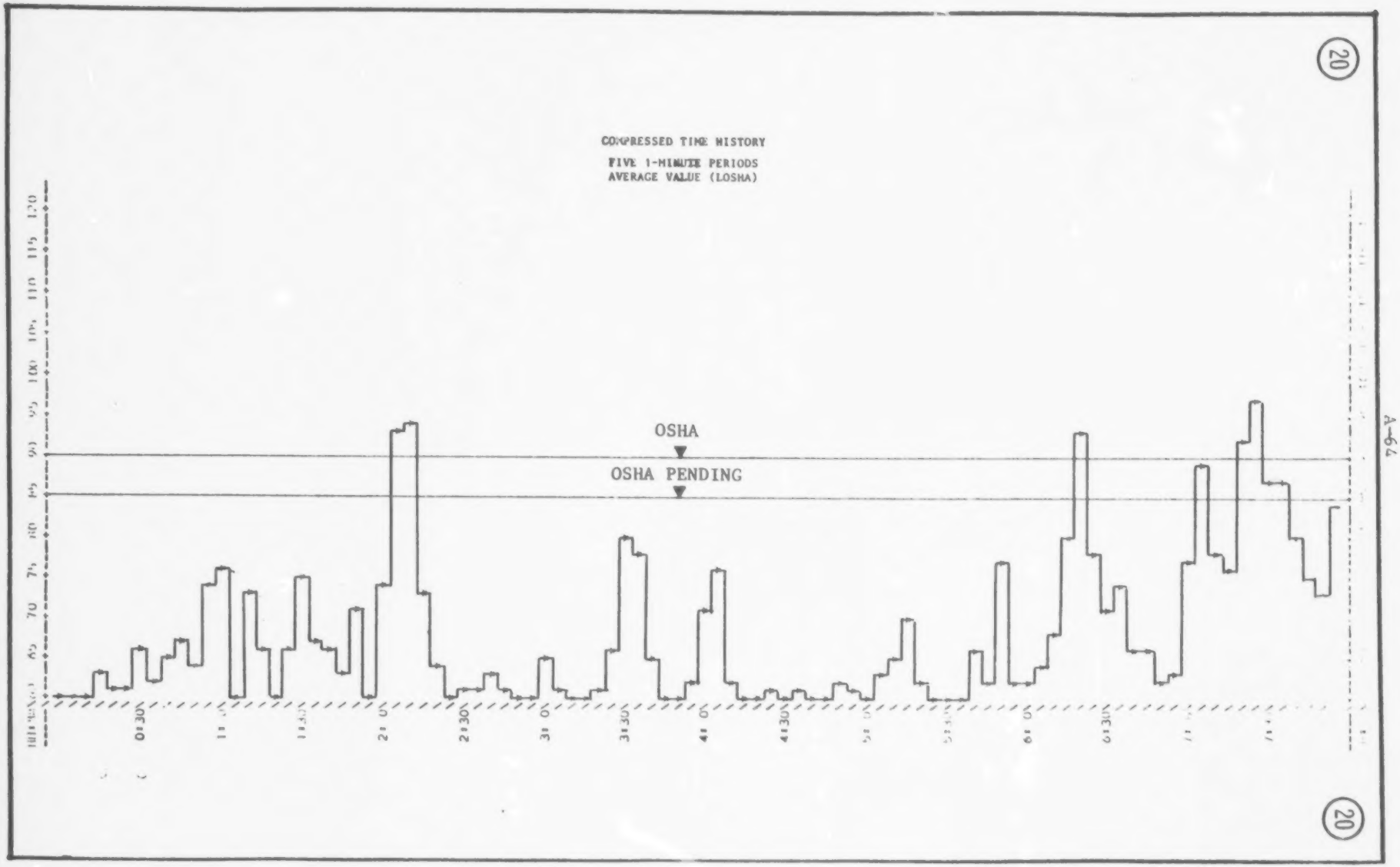
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
FOR A DAY OF THE FOLLOWING
TEST DATE = 24 AUG 1979
ACCUMULATED SAMPLING RATE = 4/SEC
ACCUMULATED SAMPLING LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME (HOUR)	LEQ(A) CURRENT	LEQ(A) CUMULATIVE	SPEC CURRENT	SPEC CUMULATIVE
1	64.9	64.9	.383	.38
2	68.9	67.2	.675	1.06
3	81.7	75.5	3.738	5.10
4	69.0	74.3	.662	5.66
5	65.3	73.2	.405	6.08
6	66.2	72.4	.461	6.54
7	78.4	73.6	2.493	9.04
8	88.4	77.1	7.627	16.66

MIN. COMP. = 60 DB MAX. COMP. = 103 DB
ARITHMETIC MEAN = 66 DB
STD. DEVIATION = 9 DB
VARIANCE = 81 DB

20


20
AMPLITUDE DISTRIBUTION
20
FREQUENCY DISTRIBUTION
FREQUENCY
PERCENT
NUMBER
PER CENT
297
61.9
51
12.7
40
8.3
25
5.2
21
4.4
19
4.0
5
1.0
8
1.7
4
.8
0
0.0
0
0.0
0
0.0
TOTAL NO. OF DATA POINTS = 480
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


20
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
20

(21)

```
60  60  60  61  60  63  60  60  60  62  60  67  62  60  60  60
62  60  60  58  93  91  91  90  95  92  91  91  91  92  92  93
93  92  98 102 102  99  96 102 103 104 101  96  97  98  74  60
65  60  60  60  63  62  60  67  61  66  91  65  65  64  62  60
60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
60  60  60  63  60  60  60  60  60  60  66  64  63  60  60  60
60  60  60  60  63  62  63  60  60  60  60  60  60  63  63  60
61  60  75  71  65  60  65  60  63  60  60  60  60  60  60  60
61  60  60  60  61  60  60  60  67  61  60  60  60  70  60  60
60  70  60  60  60  60  60  66  60  60  60  60  60  60  60  60
60  60  60  60  60  63  65  60  60  60  60  60  60  57  61  60
60  64  63  61  62  58  62  60  60  61  62  64  60  63  60  60
61  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
60  60  60  63  63  62  64  60  60  60  60  60  60  60  66  60
60  60  60  66  60  61  64  60  61  62  60  60  60  60  60  60
66  60  63  60  63  60  61  75  71  65  69  60  62  60  62  67
60  63  64  60  62  62  64  60  61  74  62  69  62  61  64  66
60  67  66  62  72  64  64  60  64  63  68  66  66  69  66  63
74  77  65  61  61  60  60  64  60  62  64  72  67  63  65  61
60  64  63  62  63  60  60  67  70  72  74  72  71  60  60  70
71  60  62  62  83  63  63  94  97  96  95  96  96  96  94  97
$EOF
```

(21)

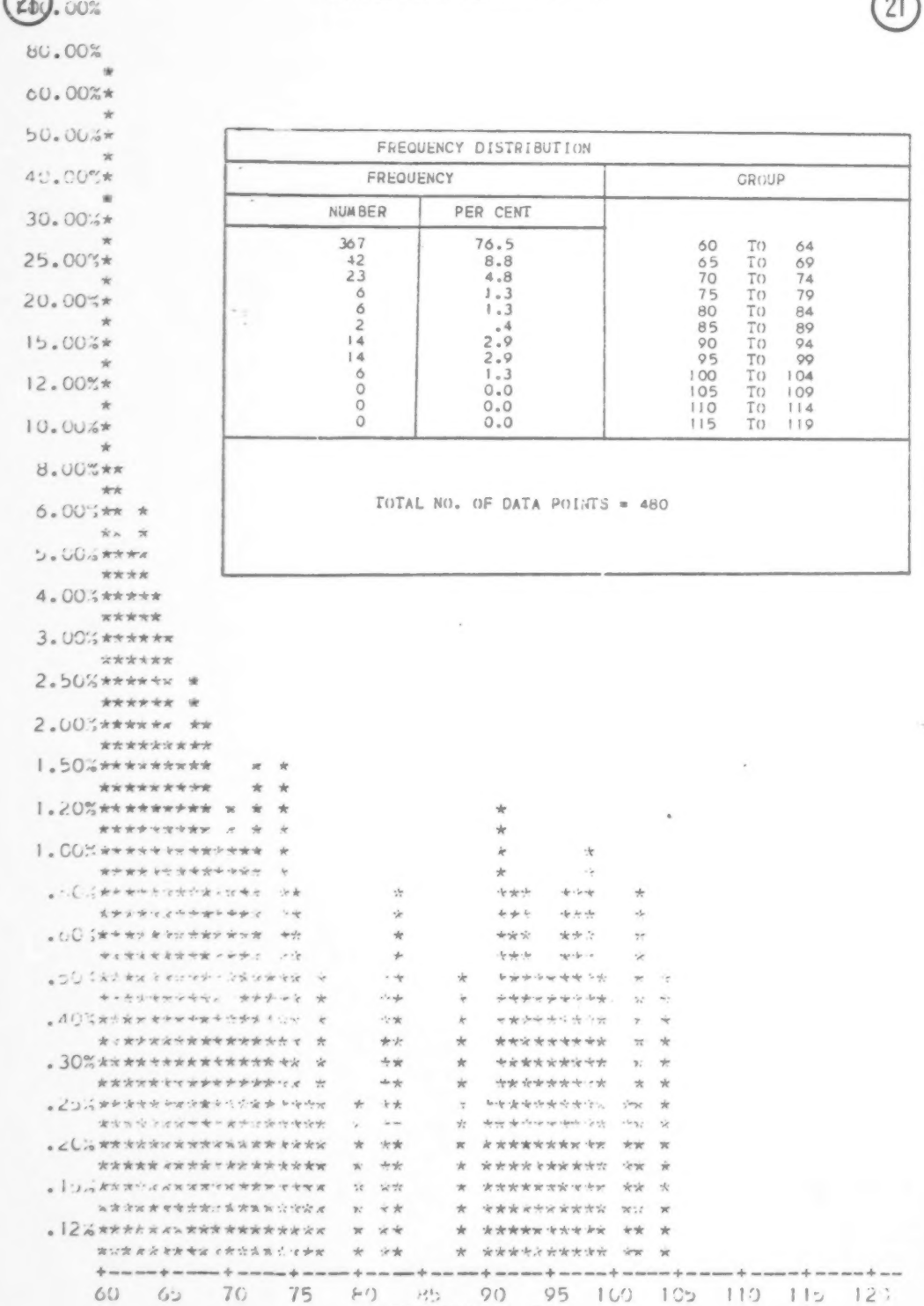
```
ENTER LOG DATE (DD/MM/YY) : 11/07/79
ENTER SITE CODE (5 CHARS) : CC247
ENTER USER CODE (4 CHARS) : 4-00
 ENTER JOB CODE (3 CHARS) : 296
```

```
    DATA LOGGED :11 JULY 1979          DATA ANALYZED : 12 SEPT 1979
        LOGGER : DR-301/26                 SITE CODE : CC247
SERIAL NO/REV : 1226                       JOB CODE : 296
      BASELI... : 0.0 V                    USER CODE : 4-00
DATA IO RANGE : 0.0 V                      CHANNEL NO : 1
 DATA SAMPLING RATE : 4/SEC          DATE/TIME OF TEST = 11/07/79 11:
TEST DURATION = 08 H 0
```

```
PERIOD =  1 MINUTES
```

```
 CHAN        MEAN          MAX          MIN          STD
    1        61.4         71.4          .181         1.36
    2        61.0         86.5          .224         1.36
    3        69.3         73.8          .605         1.71
    4        61.0         62.1          .241         1.01
    5        60.4         63.3          .241         1.02
    6        61.5         77.1          .241         1.52
    7        64.0         76.1          .362         1.98
    8        64.1         77.1          .241         1.73
 TOTAL SAMPLES =  480
 EFFECTIVE BAUD =  9600
 ERROR DEVIATION =  0.0
 ERRORS =  0
```

AMPLITUDE DISTRIBUTION



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
367	76.5	60 TO 64
42	8.8	65 TO 69
23	4.8	70 TO 74
6	1.3	75 TO 79
6	1.3	80 TO 84
2	.4	85 TO 89
14	2.9	90 TO 94
14	2.9	95 TO 99
6	1.3	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

21
21
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(22)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1212   60   64    4    1
     1781     115200  480
 60  60  60  61  64  66  70  69  60  61  65  75  78  69  62  61
 60  60  68  62  67  71  67  75  67  62  69  63  60  66  63  75
 64  60  60  67  66  60  60  70  74  72  67  60  64  62  72  68
 68  67  62  67  77  68  71  77  60  60  60  60  71  62  69  67
 66  64  74  64  76  94  91  74  83  88  85  84  82  90  98  98
 96  97  94  83  67  74  90  94  98 101  96  87  75  68  67  60
 70  72  79  80  71  61  95  92  91  93  91  96  96  92  92  90
104 104  97  95  96  99  98  93  92  96 102 101 102 103 101 102
 97  95  97 100  96  92 101 104 102  97  95  95  95  95 103  96
103 107 104 104 105 103 102 100  98  87  84  84  94 102 103  98
100 101 101  97 100  97  93  93 104 104 104 105 102  99  97 100
104 108 108 108 106  97 101 105 106 102 105 107 108 107 101 104
106 104 106 108 108 105  94  90 102 106 106 101 104 108 108 105
100 106 107 104 101 107 108 108 103 104 107 106 101 104 108 109
106 102 106 107  98 101 101  98 104 108 108 106 104 102  99  99
100 102 101 105 104 101 100 104 105 105  99  92  84  74  65  60
 60  60  60  60  60  60  60  60  60  61  60  60  60  60  60  60
 60  60  60  63  68  61  60  61  63  62  60  63  60  61  68  60
 63  73  67  72  70  90  91  94  76  75  83  86  95  97 105 105
105 104 105 106 108 107 107 107 110 107 109 109 109 109 109 108
102 101  98 100  99  91  88  93 101 101 100  99  89  92  92  90
 92  91  90  90  90  90  92  92  97  97 101 101 100  95  91  92
 95 100 102 104  99  94  92  92  92  96 102 103 105 106 104 106
104 106 105 103 102 101  99  97 103  93 100 100  99  99  98 103
104 102 102 101 103 104 105 103 103 102 101 104 103 102 103 103
 91  91 102  99 101 103 101  95  95  90  95  90  99 101 102  97
100 102 102  94 103  99  90  90  92  91  93  95  98  99  98 103
101 103 101 102 101 101 103 102 102 101 102 101 101  85  60  62
 68  84  83  85  78  80  80  75  74  81  76  61  60  60  60  60
 60  60  60  60  60  60  60  61  60  70  65  77  78  78  73  77
%EOF
```

(22)

```
ENTER LOG DATE (DD/MM/YR) : 10/09/79

ENTER SITE CODE (5 CHARS) : 00326
ENTER USER CODE (4 CHARS) : 4822
 ENTER JOB CODE (3 CHARS) : 176
```

```
   DATA LOGGED :10 SEPT 1979
        LOGGER : DB-301/26
SERIAL NUMBER : 1212
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8 HR 20 MIN

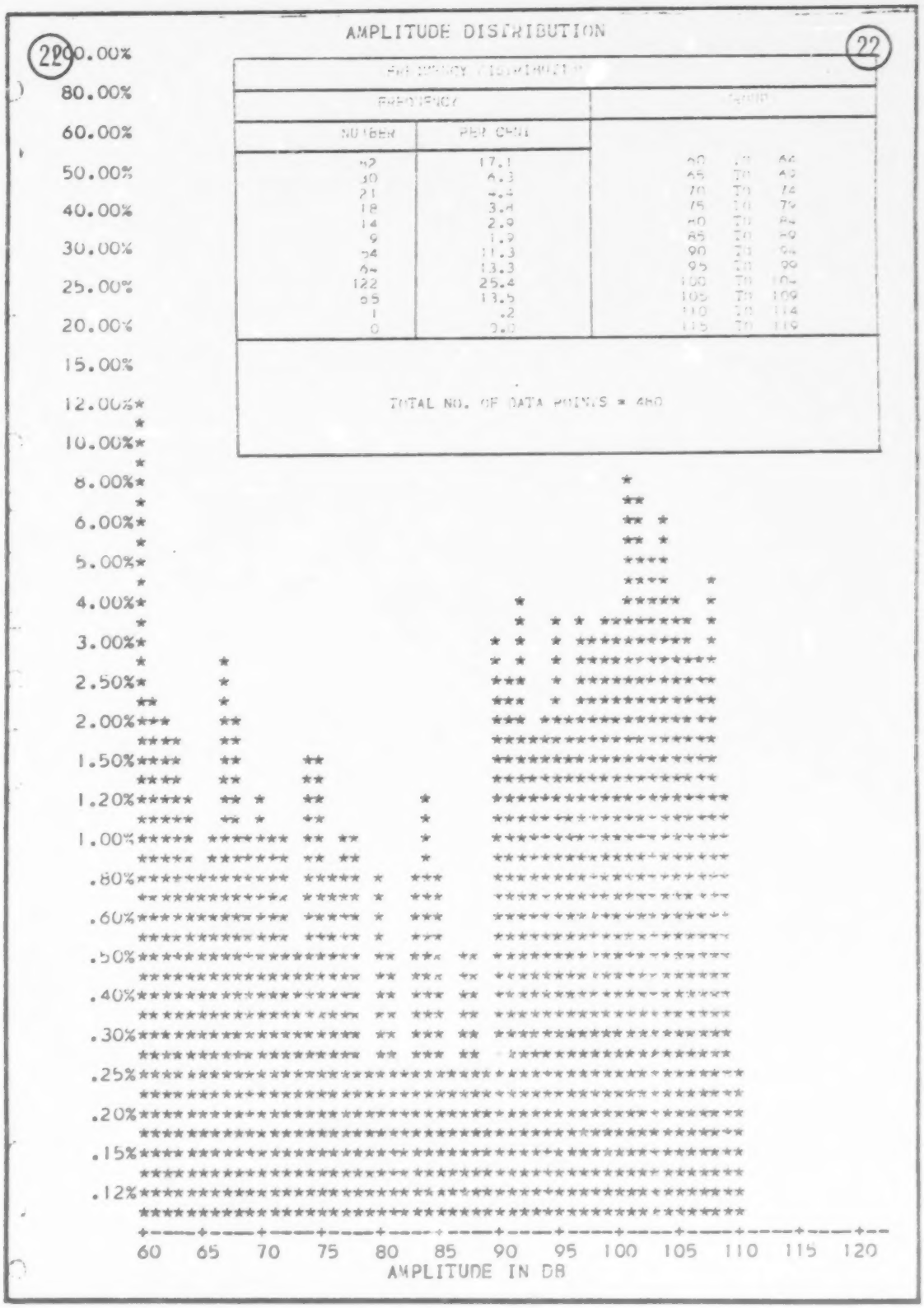
DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 00326
     JOB CODE : 176
    USER CODE : 4822
  RECORDER # :  1212
TOTAL SAMPLES =  115200
 STARTED TIME =  08:12:00
```

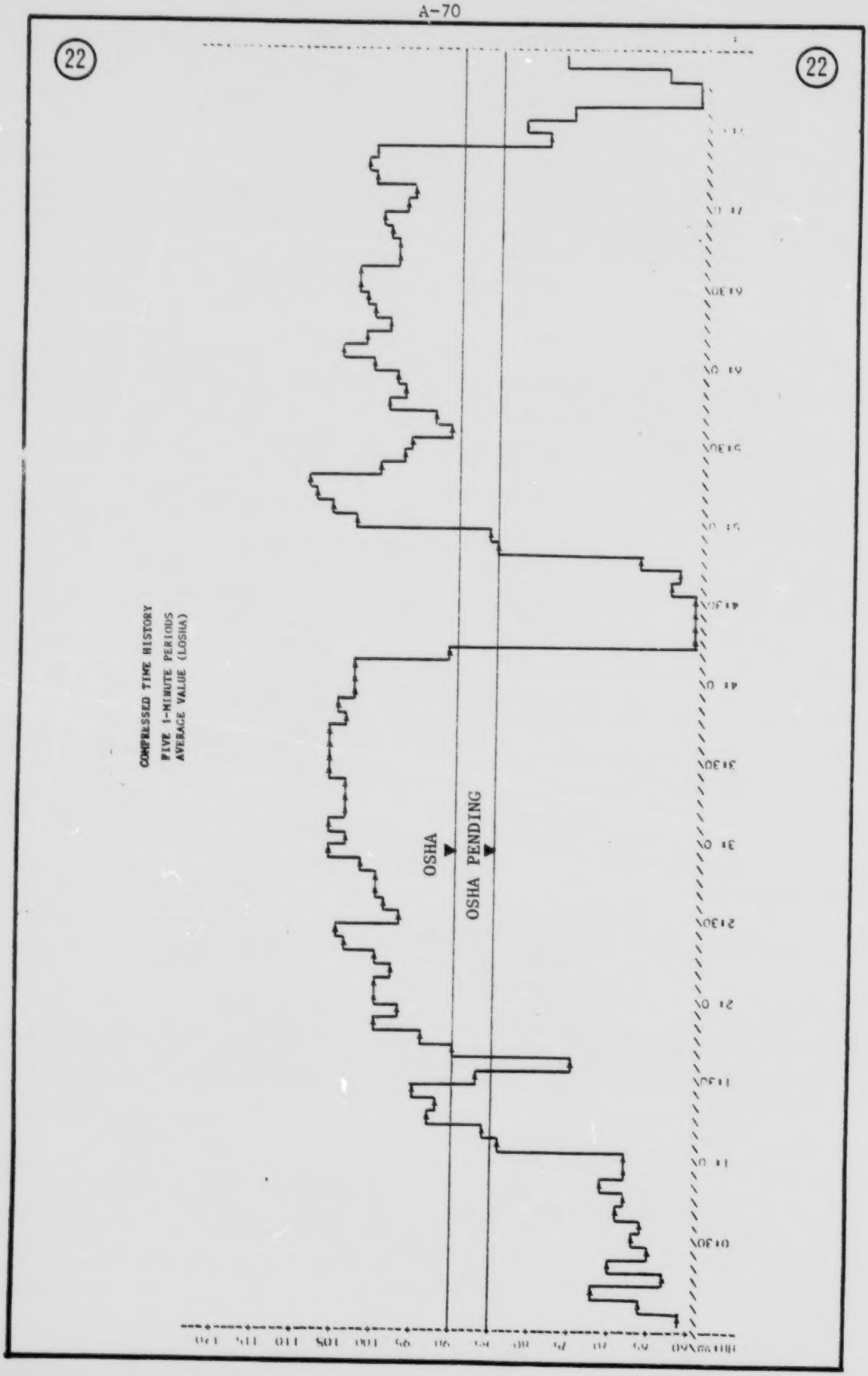
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 2 HRS / 8 HRS
CRITERION (CONTROLLED) RATE = 5 DB
RECORDED (TIME) LEVEL = 90 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LEVEL		EXPOSURE	
HOUR	INCREMENT	CUMULATIVE	INCREMENT	CUMULATIVE
1	87.8	87.8	.574	.57
2	92.1	87.4	16.805	17.38
3	101.4	95.3	60.439	77.82
4	104.2	97.9	97.347	175.17
5	91.3	96.0	14.960	190.13
6	101.8	98.8	64.177	254.31
7	101.3	99.2	60.067	314.38
8	94.9	98.7	21.440	335.82

MIN. DOSE. = 60 DB MAX. DOSE. = 110 DB
ARITHMETIC MEAN = 88 DB
STD. DEVIATION = 17 DB
VARIANCE = 299 DB


AMPLITUDE DISTRIBUTION
22
22
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
RANGE
42 17.1 60 TO 64
20 8.3 65 TO 69
21 8.4 70 TO 74
18 3.8 75 TO 79
14 2.9 80 TO 84
9 1.9 85 TO 89
54 11.3 90 TO 94
64 13.3 95 TO 99
122 25.4 100 TO 104
65 13.5 105 TO 109
1 .2 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


22
22
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(23)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
   1   20   80  1218    60    64     4     1
      204      115200  480
  66  69  66  61  63  67  69  64  63  68  72  73  62  65  66  76
  75  76  63  63  60  61  71  68  70  74  75  79  71  69  69  69
  60  65  65  65  73  75  71  63  74  69  65  71  71  64  60  67
  65  64  66  62  67  60  60  62  60  60  61  60  60  60  60  60
  64  63  62  70  68  68  69  63  60  62  60  60  60  60  60  60
  60  66  60  60  60  61  61  66  62  60  94 100  71  70  65  67
  91  90  90  91  91  91  90  90  91  90  99  92  86  86  85  84
  84  85  85  85  85  86  85  83  84  88  92  90  85  89  85  85
  87  93  85  84  88 100  91  91  93  88  87  89  87  87  88  92
  92  90  88  91  91  91  92  88  92  94  88  87  87  87  85  86
  91  88  88  88  88  89  90  86  88  86  87  85  86  87  88  87
  93  95  99  85  83  85  87  91  86  85  86  87  85  87  93  89
  86  86  85  86  85  85  86  85  85  85  85  89  88  84  85  91
  86  89  98  85  85  85  86  86  89  84  86  91  91  85  89  98
  93  88  95  94  92  93  80  84  80  66  76  95  97  94  99  97
  94  95  97  99  96  78  95  98  79  78  75  61  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  61  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  63  60  62  60  60  60  60  60  60  60  60  60  60  60  60  62
  60  62  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  63  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  61  64  60  61  71  84  82  90  98  95 100  90  84  90
  89  87  90  86  90  96  96 102  98  92  92  91  88  91  90  89
  89  91  91  90  92  90  91  91  92  97  93 100 105 104  95  95
  92  91  96  94  91  94  94  93  95  98  92  91  91  88  73  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
*EOF
```

(23)

```
ENTER LOG DATE (DD/MM/YR) : 10/09/79
ENTER SITE CODE (5 CHARS) : 00326
ENTER USER CODE (4 CHARS) : 4748
 ENTER JOB CODE (3 CHARS) : 176
```

```
   DATA LOGGED :10 SEPT 1979
        LOGGER : DB-301/26
SERIAL NUMBER : 1218
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =    0: 2: 0

DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 00326
     JOB CODE : 176
    USER CODE : 4748
   TAPE SEQ.# :  8 33
TOTAL SAMPLES =  115200
 STARTAY TIME =  0: 0: 0.0
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TABLE DATA = 20 DB / 8 HRS
EXCHANGE (CRITERION) RATE = 5 DB
CRITERION (CRITERION) LEVEL = 90 DB
NUMBER OF CORRELATIONS = 480
PERIOD = 1 MINUTES

TIME	LOUDNESS		SOUND	
(MIN)	(PHONES)	(RELATIVE)	(PASCALS)	(SOUND N.E.L.)
1	60.0	60.0	.047	.69
2	85.9	81.5	7.041	7.69
3	89.9	85.5	12.312	11.61
4	89.0	85.7	11.758	11.77
5	81.6	86.0	4.692	12.05
6	80.4	84.7	.206	35.59
7	81.0	84.3	3.574	30.44
8	90.2	85.9	10.128	50.34

MIN. COMP. = 60 DB MAX. COMP. = 105 DB
ARITHMETIC MEAN = 74 DB
STD. DEVIATION = 14 DB
VARIANCE =195 DB

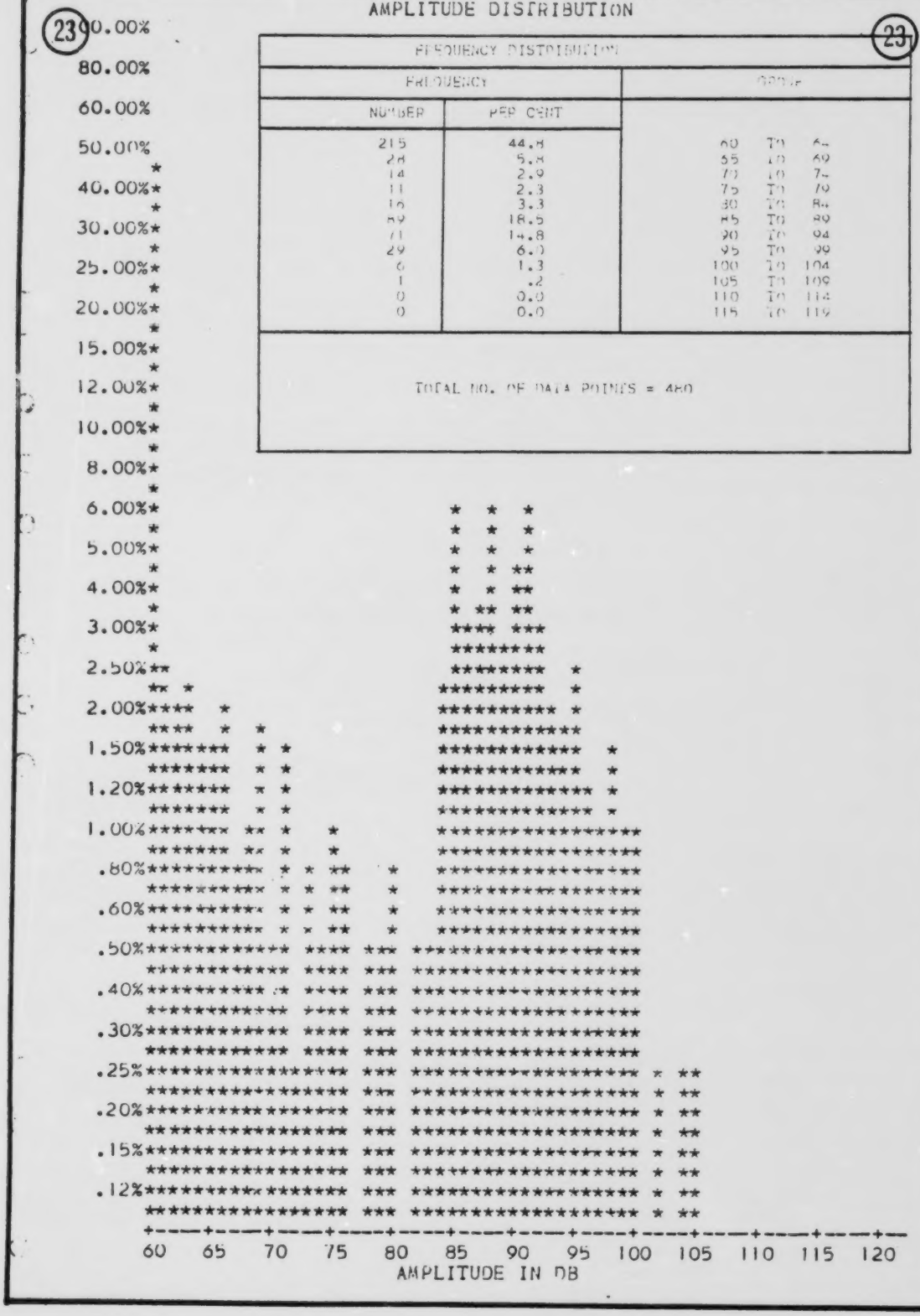
AMPLITUDE DISTRIBUTION

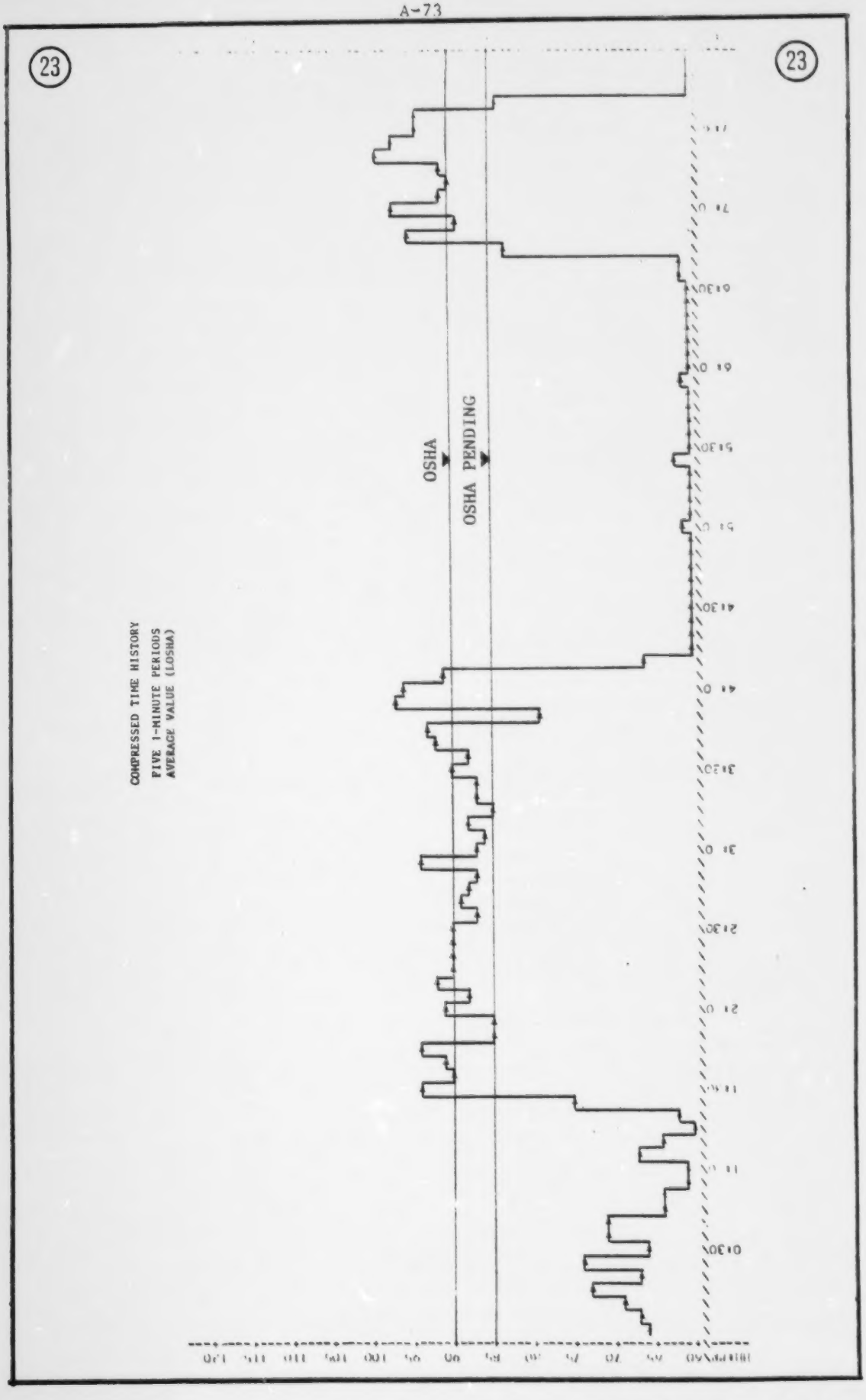
(23)

FREQUENCY DISTRIBUTION

FREQUENCY		RANGE
NUMBER	PER CENT	
215	44.8	60 TO 64
28	5.8	65 TO 69
14	2.9	70 TO 74
11	2.3	75 TO 79
16	3.3	80 TO 84
89	18.5	85 TO 89
71	14.8	90 TO 94
29	6.0	95 TO 99
6	1.3	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




23
23
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0130
2130
3130
4130
5130
6130
7130

(24)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1213    60    64     4     1
   14588     115200   480
 60  60  63  60  60  60  61  75  62  61  63  61  63  60  61  62
 60  64  70  71  70  63  64  87  87  91  89  90  91  88  83  80
 92  89  90  95  71  81  90  96  95  94  86  65  67  89  89
 86  91  96  99  94  91  91  90  82  60  62  60  60  60  60  60
 60  60  60  60  61  60  60  62  60  60  61  62  61  60  62  60
 61  65  60  63  84  67  79  72  67  74  77  72  63  72  83  71
 72  81  77  64  83  81  86  86  85  83  74  73  75  75  74  77
 75  75  65  69  72  65  70  67  67  70  69  65  67  62  60  60
 60  60  60  73  63  74  66  66  60  60  63  75  64  60  64  70
 71  80  74  71  75  71  71  71  78  63  66  72  71  67  74  72
 72  60  60  60  60  60  60  60  62  60  60  64  70  65  60  64
 66  71  66  65  70  61  65  73  72  69  61  73  64  72  84  71
 78  72  74  76  73  70  68  77  74  71  76  66  77  77  70  74
 67  76  71  70  74  76  65  65  61  76  77  74  72  67  73  73
 83  68  62  60  60  60  60  60  62  82  99  84  70  71  64  71
 71  65  73  74  60  74  68  65  73  71  70  69  79  76  71  69
 63  68  66  60  73  60  60  60  60  63  60  60  60  60  60  60
 60  60  60  60  60  60  60  65  60  60  60  60  60  60  60  60
 60  60  60  61  81  73  74  72  60  65  64  72  67  72  72  73
 77  73  70  71  71  76  70  80  68  71  72  73  64  73  67  73
 66  77  76  72  64  72  75  74  69  72  72  65  69  60  61  69
 67  63  61  71  65  76  69  77  75  72  73  68  68  73  70  71
 69  74  78  75  74  85  79  76  97  75  71  68  72  77  70  65
 76  68  78  70  63  75  68  66  66  79  91  79  76  90  71  75
 72  76  81  75  78  81  74  77  73  72  65  73  76  72  74  77
 77  70  66  84  60  73  68  61  77  76  72  73  72  73  69  72
 78  83  90  88  91  94  94  99  95  89  86  91  76  68  92  93
 94  95  91  92  80  83  75  63  73  60  71  60  79  60  78  66
 77  71  63  62  67  67  62  62  62  60  60  61  60  60  69  60
 68  83  85  79  78  81  81  80  82  84  86  83  86  84  87  85
*EOF
```

(24)

```
ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : ?????
ENTER USER CODE (4 CHARS) : 4816
 ENTER JOB CODE (3 CHARS) : 000
```

```
   DATA LOGGED :31 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : ?????
SERIAL NUMBER : 1213                       JOB CODE : 000
     BASELINE : 60 DB                     USER CODE : 4816
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   1: 0:47
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

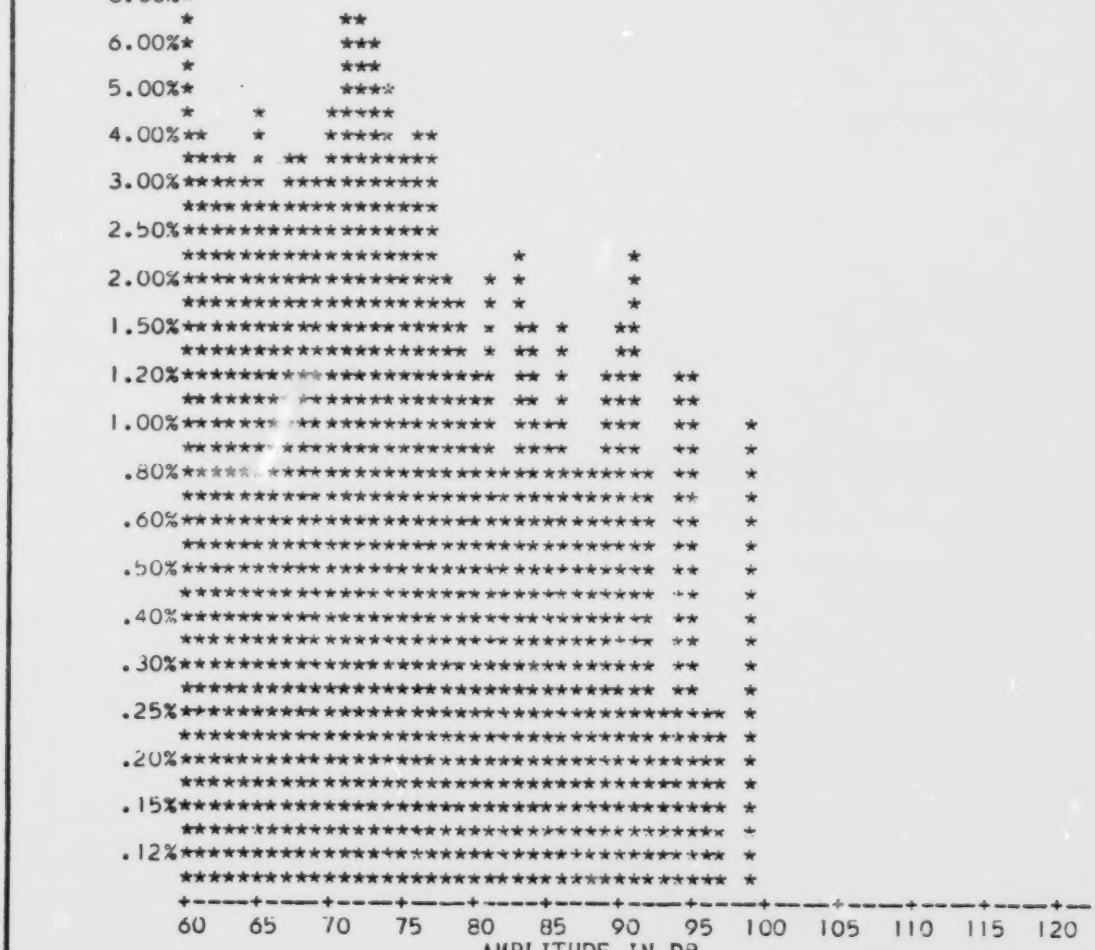
TIME	OSHA		NOISE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.8	86.8	8.052	8.05
2	74.4	83.0	1.432	9.48
3	68.5	80.5	.633	10.12
4	76.5	79.7	1.924	12.04
5	67.7	78.5	.570	12.61
6	72.8	77.8	1.159	13.77
7	79.0	78.0	2.719	16.49
8	85.0	79.3	6.249	22.74

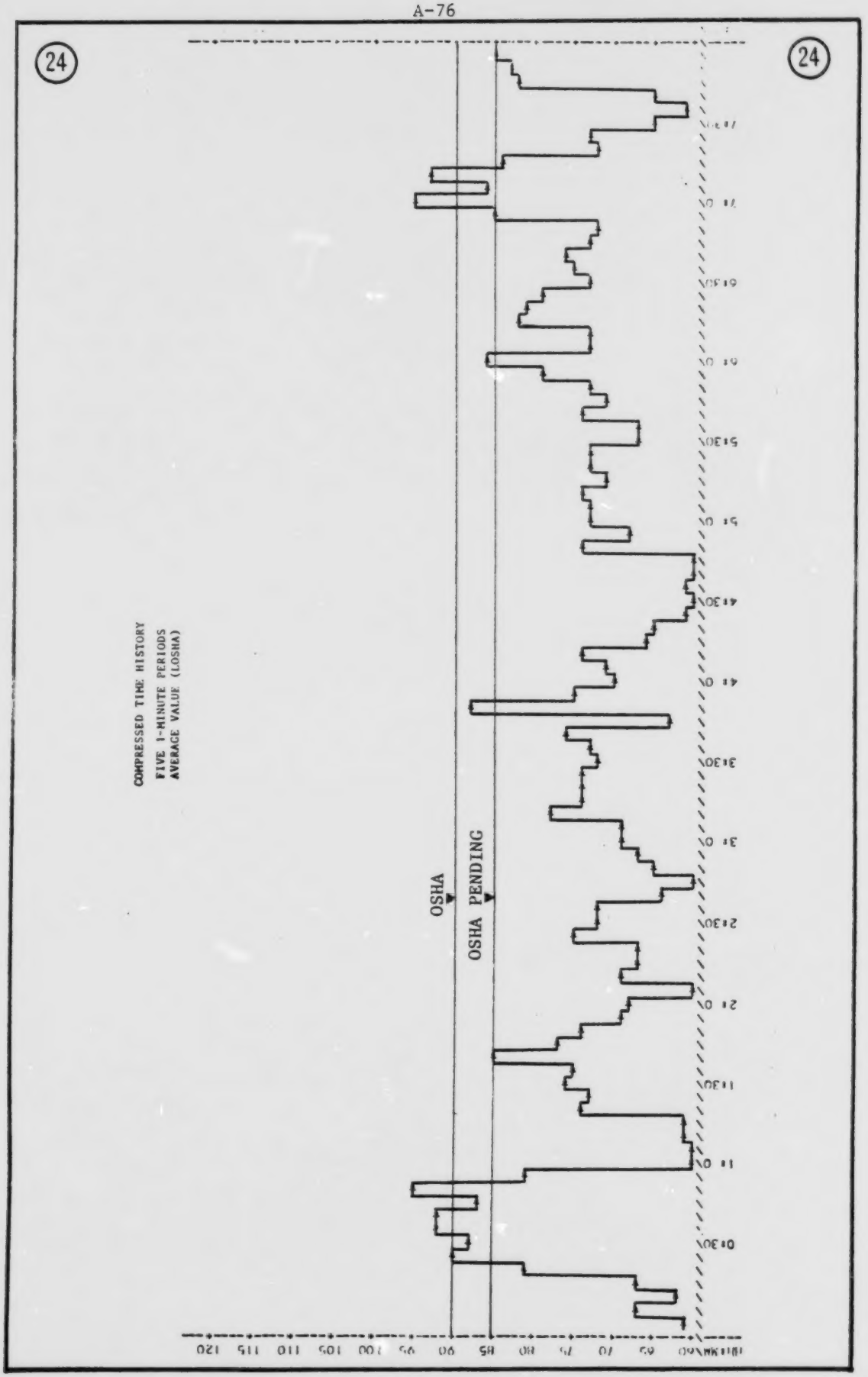
MIN. COMP. = 60 DB MAX. COMP. = 99 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 10 DB
VARIANCE =100 DB

AMPLITUDE DISTRIBUTION

(24) (24)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
144	30	60 TO 64
70	14.6	65 TO 69
117	24.4	70 TO 74
62	12.9	75 TO 79
31	6.5	80 TO 84
21	4.4	85 TO 89
24	5.0	90 TO 94
11	2.3	94 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




24
24
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dB(ASW)/60
60
65
70
75
80
85
90
95
100
105
110
115
120
0h30'
1h 0'
1h30'
2h 0'
2h30'
3h 0'
3h30'
4h 0'
4h30'
5h 0'
5h30'
6h 0'
6h30'
7h 0'

(25)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1218    60    64     4     1
      55      115200   480
 60  60  60  60  63  60  60  70  76  69  61  60  60  60  65  69
 63  66  68  62  67  66  71  65  69  83  90  72  60  78  60  60
 61  60  60  75  63  69  86  65  61  70  72  61  66  60  75  63
 77  83  88  90  99  95  91  86  89  87  66  61  66  60  60  60
 60  60  60  60  61  60  60  60  60  60  60  60  60  61  61  61
 60  61  66  60  69  72  85  77  79  77  73  80  63  71  80  89
 90  75  74  81  71  77  80  81  84  83  84  79  74  81  77  79
 73  79  79  73  67  74  80  78  75  80  73  75  75  73  83  73
 70  66  71  71  72  62  66  78  74  71  72  77  71  66  77  71
 76  77  82  83  72  80  74  81  79  81  80  79  73  73  74  76
 76  78  72  68  60  60  60  60  60  65  65  60  61  77  73  63
 61  79  72  71  73  75  76  78  73  71  71  78  72  78  64  78
 82  77  78  80  80  80  80  81  82  83  82  81  75  73  80  81
 74  78  66  77  79  76  80  72  63  67  76  71  71  78  71  73
 81  82  83  66  62  67  60  60  60  60  81  81  99  85  73  78
 73  70  76  73  79  68  72  78  79  81  81  78  79  78  84  78
 74  68  67  74  66  73  78  69  66  60  62  66  60  61  60  60
 60  60  60  60  60  60  60  60  60  67  60  60  60  60  60  60
 60  64  89  79  60  63  81  67  70  75  66  72  75  79  68  75
 74  74  78  76  68  72  76  76  77  81  74  76  79  70  69  71
 61  65  66  75  74  68  68  80  80  71  76  74  83  71  63  68
 77  61  81  67  71  77  65  79  68  76  69  68  68  65  69  69
 69  76  77  65  70  70  69  84  76  85  99  77  72  70  69  75
 71  66  76  71  79  70  73  66  76  77  76  84  88  71  79  92
 79  80  79  82  77  75  74  76  75  72  69  74  60  74  71  76
 74  75  72  69  65  82  64  73  66  72  82  78  80  77  70  73
 79  80  81  91  93  93  95  97  99  97  98  86  86  90  72  80
 93  94  95  95  95  88  82  82  69  67  71  71  75  66  81  61
 83  79  82  74  65  62  66  62  71  79  95 100 100  93  63  70
 96  98 103  99  98  82  83  94  93  66  60  60  60  84  98 103
END
```

(25)

```
ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : SHAJI
ENTER USER CODE (4 CHARS) : 4759
 ENTER JOB CODE (3 CHARS) : 000
```

```
   DATA LOGGED :31 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : SHAJI
SERIAL NUMBER : 1218                       JOB CODE : 000
      BASELINE : 60 DB                     USER CODE : 4759
 DYNAMIC RANGE : 54 DB                     THRESHOLD : 60 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:13
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	OSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	80.2	80.2	3.202	3.20
2	76.7	78.6	1.978	5.18
3	75.4	77.7	1.699	6.84
4	79.2	78.1	2.796	9.63
5	73.2	77.4	1.225	10.86
6	74.3	76.9	1.125	12.08
7	79.9	77.5	3.021	15.34
8	91.6	81.6	15.667	31.04

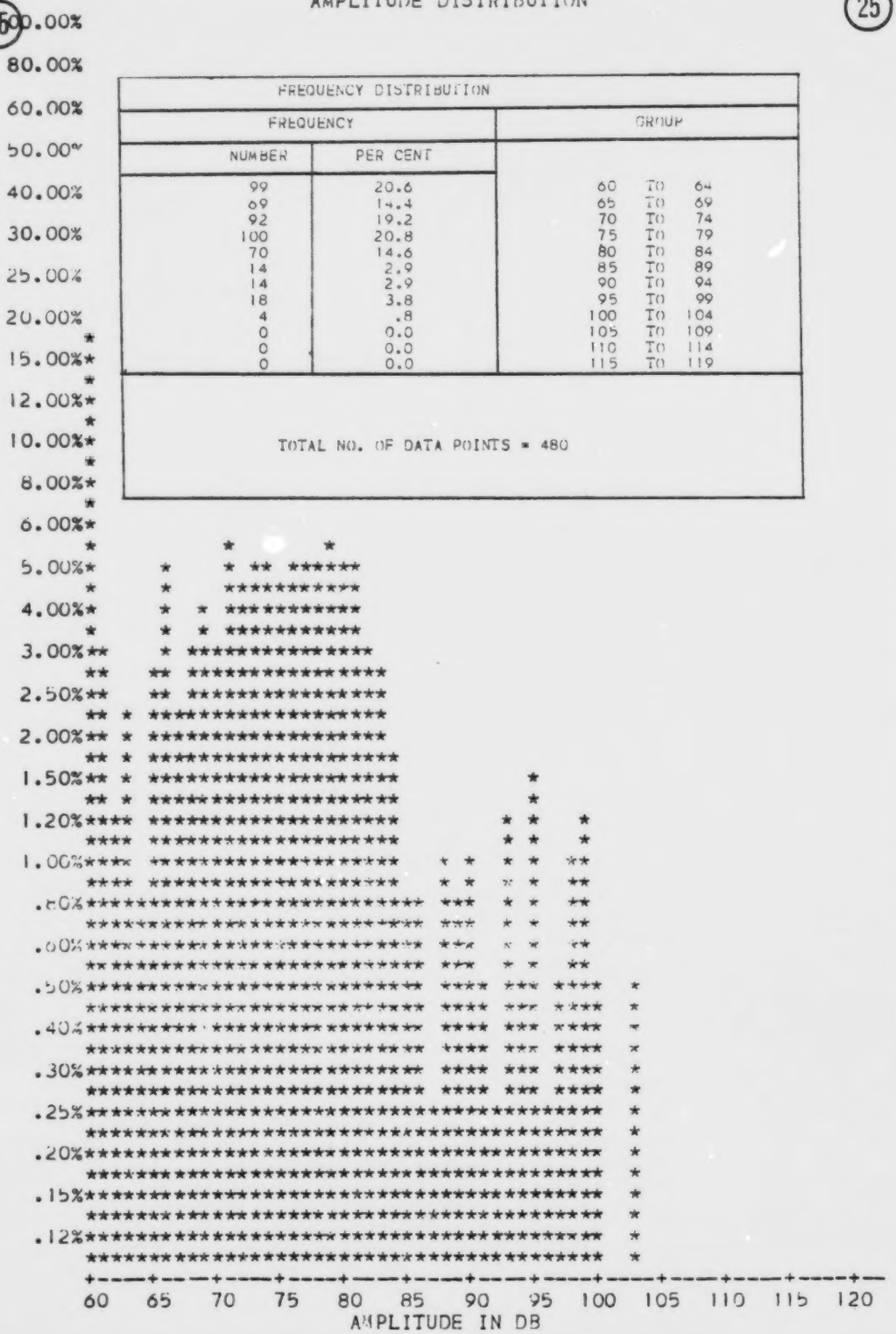
MIN. COMP. = 60 DB MAX. COMP. = 103 DB
ARITHMETIC MEAN = 73 DB
STD. DEVIATION = 10 DB
VARIANCE =100 DB

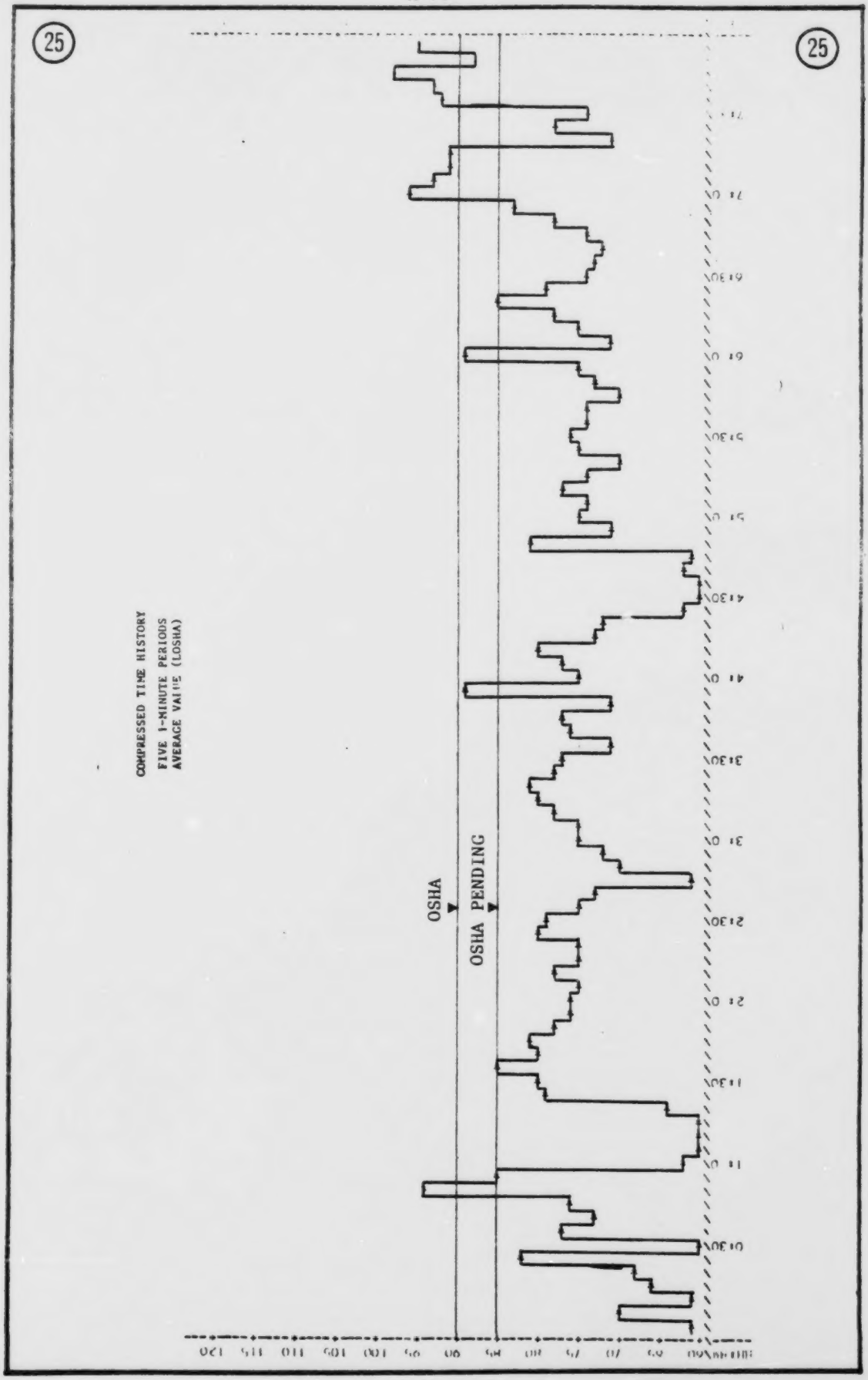
AMPLITUDE DISTRIBUTION

(25) (26)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
99	20.6	60 TO 64
69	14.4	65 TO 69
92	19.2	70 TO 74
100	20.8	75 TO 79
70	14.6	80 TO 84
14	2.9	85 TO 89
14	2.9	90 TO 94
18	3.8	95 TO 99
4	.8	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




25
25
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
90
95
100
105
110
115
120
01:30
1
1:30
2
2:30
3
3:30
4
4:30
5
5:30
6
6:30
7
7:30

(26)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1213 60 64 4 1
48 115200 480

60	60	61	60	60	60	60	60	60	62	60	60	60	60	60	60
60	60	60	60	60	60	60	69	71	60	63	60	63	60	61	71
61	63	60	64	60	61	62	66	63	66	60	62	63	63	63	67
62	86	85	81	83	62	60	60	60	60	77	60	60	60	73	64
60	60	60	60	60	60	60	60	60	60	60	78	60	60	60	72
72	60	60	72	65	60	78	71	75	66	78	69	71	74	72	64
82	83	81	76	81	81	84	82	82	82	75	82	86	80	75	65
69	69	67	74	79	72	60	64	76	83	85	77	83	84	92	102
93	86	89	86	72	60	60	60	78	84	87	83	82	81	82	86
80	82	79	76	71	72	74	86	81	81	83	75	76	72	81	85
84	85	84	89	78	84	73	66	70	73	67	61	73	72	74	69
70	79	78	78	72	70	67	67	71	60	64	60	78	67	68	63
64	72	70	79	82	78	62	74	79	73	73	76	81	73	66	75
65	80	84	76	77	78	76	79	85	78	70	60	64	79	74	73
67	72	70	76	68	63	75	73	73	64	62	61	60	60	73	74
68	70	62	69	73	73	76	71	60	66	76	61	63	60	74	75
84	83	73	75	76	75	73	76	90	82	71	75	76	88	71	75
76	69	62	65	60	60	60	60	60	60	60	61	70	60	60	60
60	60	60	60	79	60	67	73	60	80	82	75	75	78	60	60
60	60	60	60	70	76	60	84	60	68	60	60	61	72	80	69
93	78	78	91	91	89	91	90	91	90	90	85	84	92	91	85
66	68	75	69	66	64	60	62	60	66	62	60	60	62	68	62
61	65	61	60	63	65	60	60	61	60	63	60	60	64	66	70
66	60	66	60	62	62	60	61	67	62	66	67	67	72	78	75
74	70	66	60	62	68	60	67	62	77	87	91	84	89	84	84
84	85	83	84	82	81	82	84	83	84	83	87	95	74	60	60
63	60	60	61	60	60	61	60	60	60	63	60	63	69	69	66
60	60	60	61	60	60	71	62	76	67	79	89	96	101	101	81
60	60	63	96	92	89	89	89	92	103	99	92	96	103	89	84
83	85	76	64	85	84	72	80	73	68	62	60	60	70	90	73

END

(26)

ENTER LOG DATE (DD/MN/YR) : 17/08/79
ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 4692
ENTER JOB CODE (3 CHARS) : CON

DATA LOGGED :17 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1213
BASELINE : 50 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 HR 0 MIN

DATA ANALYZED : 21 SEPT 1979
SITE CODE : ISHAF
JOB CODE : CON
USER CODE : 4692
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0 HR 0 MIN

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOXIC DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LOGIA CURRENT	LOGIA CUMULATIVE	DOSE CURRENT	DOSE CUMULATIVE
1	70.1	70.1	.793	.79
2	75.1	73.0	1.583	2.38
3	63.9	78.6	.333	2.71
4	74.5	77.3	1.449	4.16
5	74.4	77.2	1.433	10.59
6	80.7	77.9	3.448	14.04
7	78.8	78.0	2.643	16.68
8	80.0	80.3	9.446	26.13

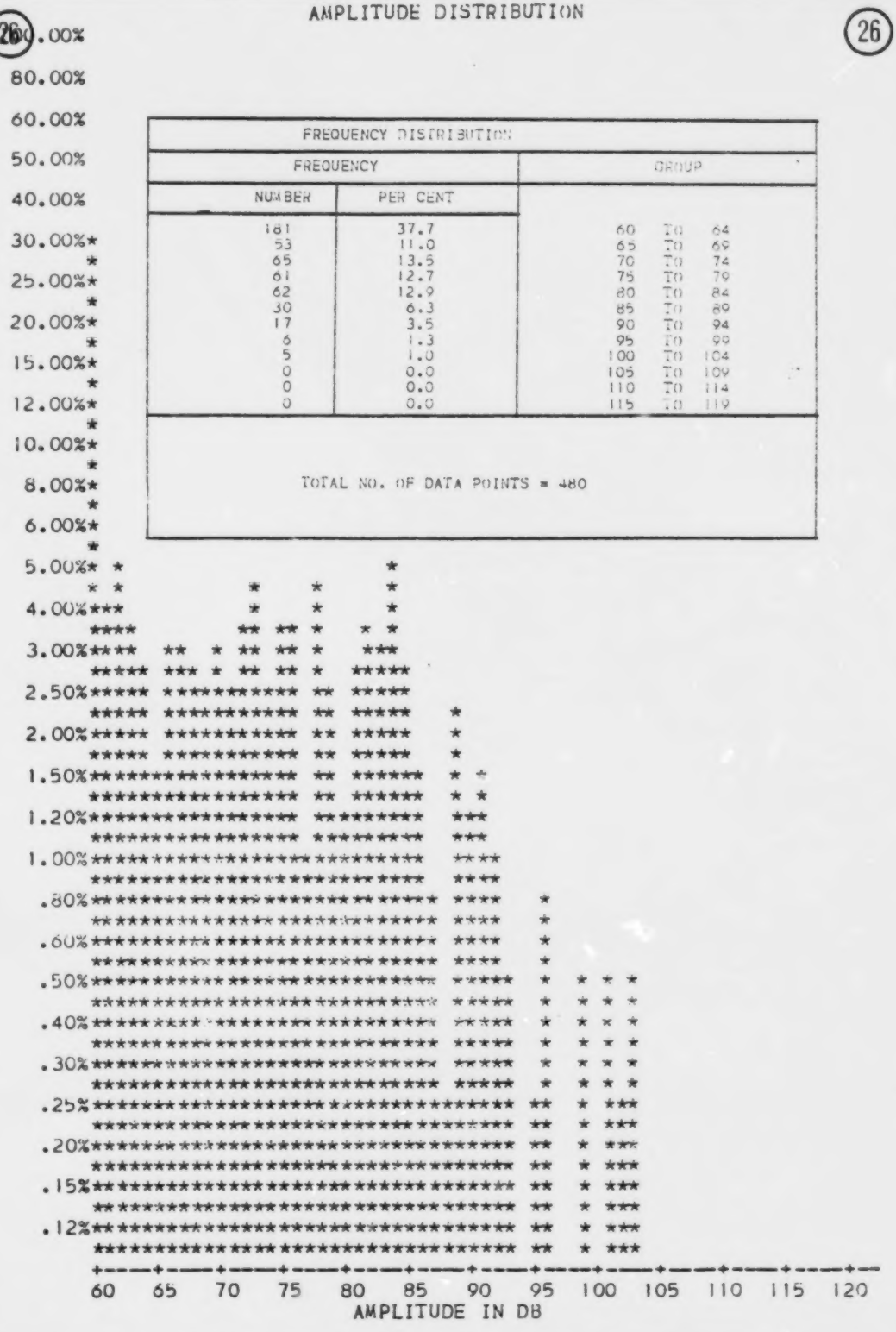
MIN. COMP. = 60 DB MAX. COMP. = 103 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 11 DB
VARIANCE = 121 DB

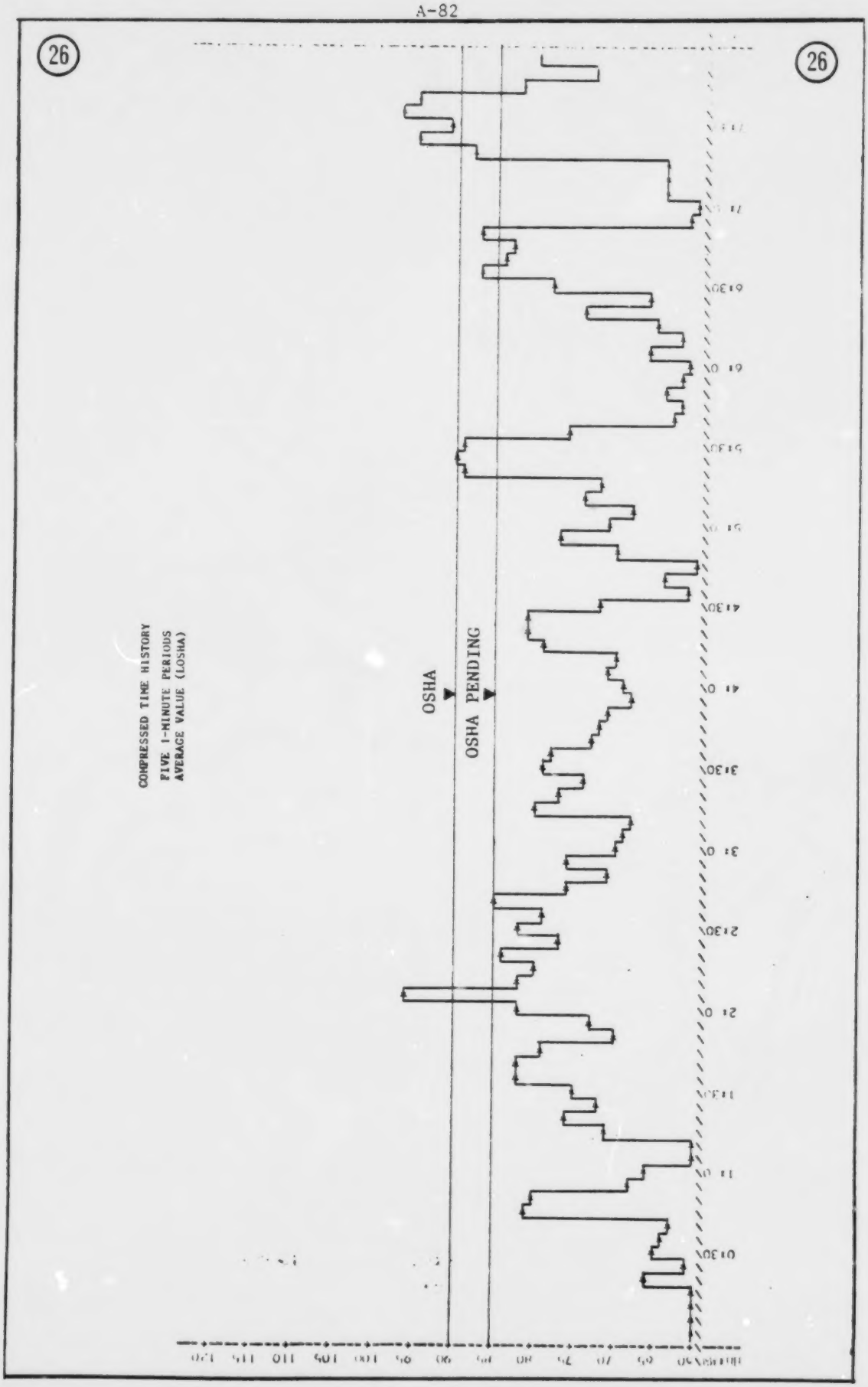
AMPLITUDE DISTRIBUTION

(26) (26)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
181	37.7	60 TO 64
53	11.0	65 TO 69
65	13.5	70 TO 74
61	12.7	75 TO 79
62	12.9	80 TO 84
30	6.3	85 TO 89
17	3.5	90 TO 94
6	1.3	95 TO 99
5	1.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




26
26
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(27)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1218    60    64     4     1
      37     115200   480
  60  60  60  60  60  60  60  69  60  60  60  60  60  60  64  60
  60  60  62  60  60  60  60  60  60  61  60  60  60  60  60  60
  60  60  63  61  60  60  60  77  93 100  91  95  93  85  83  81
  63  63  76  84  71  60  74  60  65  60  73  71  76  64  67  85
  72  79  76  72  76  76  65  72  84  81  66  68  68  67  79  91
  83  80  88  62  63  80  60  60  60  60  64  60  60  60  60  60
  78  66  60  60  81  61  60  85  60  60  60  60  60  60  60  67
  60  80  60  60  76  84  60  63  67  83  82  82  87  83  62  60
  60  60  76  60  83  73  60  60  76  78  65  60  76  73  60  60
  60  69  86  60  71  78  76  84  63  62  75  91  85  83  81  86
  91  90  85  89  69  74  69  60  69  80  89  86  91  84  83  85
  84  81  84  88  86  92  95  89  91  89  90  89  90  89  89  88
  88  88  90  89  92  91  94  86  86  85  88  86  87  82  85  86
  90  90  86  92  90  86  87  89  94  97  99  98  92  97  93  97
  97  99  96  96  94  97  99  98  96  94  96  94  96  96  94  98
  93  94  89  91  87  83  96  82  77  71  82  74  83  75  68  80
  60  60  62  66  66  68  69  61  60  81  74  80  65  64  62  60
  60  60  60  60  62  60  60  60  60  63  60  62  67  60  62  65
  61  67  64  60  79  75  74  80  80  81  89  74  67  71  68  87
  90  87  88  87  87  87  87  86  88  88  74  60  60  60  60  60
  61  60  60  60  60  60  61  69  64  62  62  64  66  60  60  60
  60  60  60  60  60  60  60  60  61  60  60  62  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  63  66  63  60
  64  60  61  60  72  84  82  82  84  82  83  93  88  66  60  60
  60  60  60  60  60  60  60  60  65  62  60  60  60  60  60  60
  60  60  60  67  72  90  93  88  92  87  80  85  94  88  90  89
%EOF
```

(27)

```
ENTER LOG DATE (DD/MM/YR) : 17/08/79

ENTER SITE CODE (5 CHARS) : ISHAF

ENTER USER CODE (4 CHARS) : 4727
 ENTER JOB CODE (3 CHARS) : 240
```

```
    DATA LOGGED :17  AUG 1979          DATA ANALYZED : 25 SEPT 1979
         LOGGER : DB-301/26                SITE CODE : ISHAF
SERIAL NUMBER : 1218                       JOB CODE : 240
      BASELINE : 60 DB                     USER CODE : 4727
DYNAMIC RANGE : 64 DB                      THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0: 0
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	79.1	79.1	2.754	2.76
2	75.4	77.5	1.644	4.40
3	81.4	79.0	3.775	8.18
4	92.9	82.5	18.610	26.79
5	79.1	84.6	2.750	29.54
6	76.4	83.7	1.889	31.43
7	60.0	82.7	.195	31.62
8	80.4	82.4	3.287	34.91

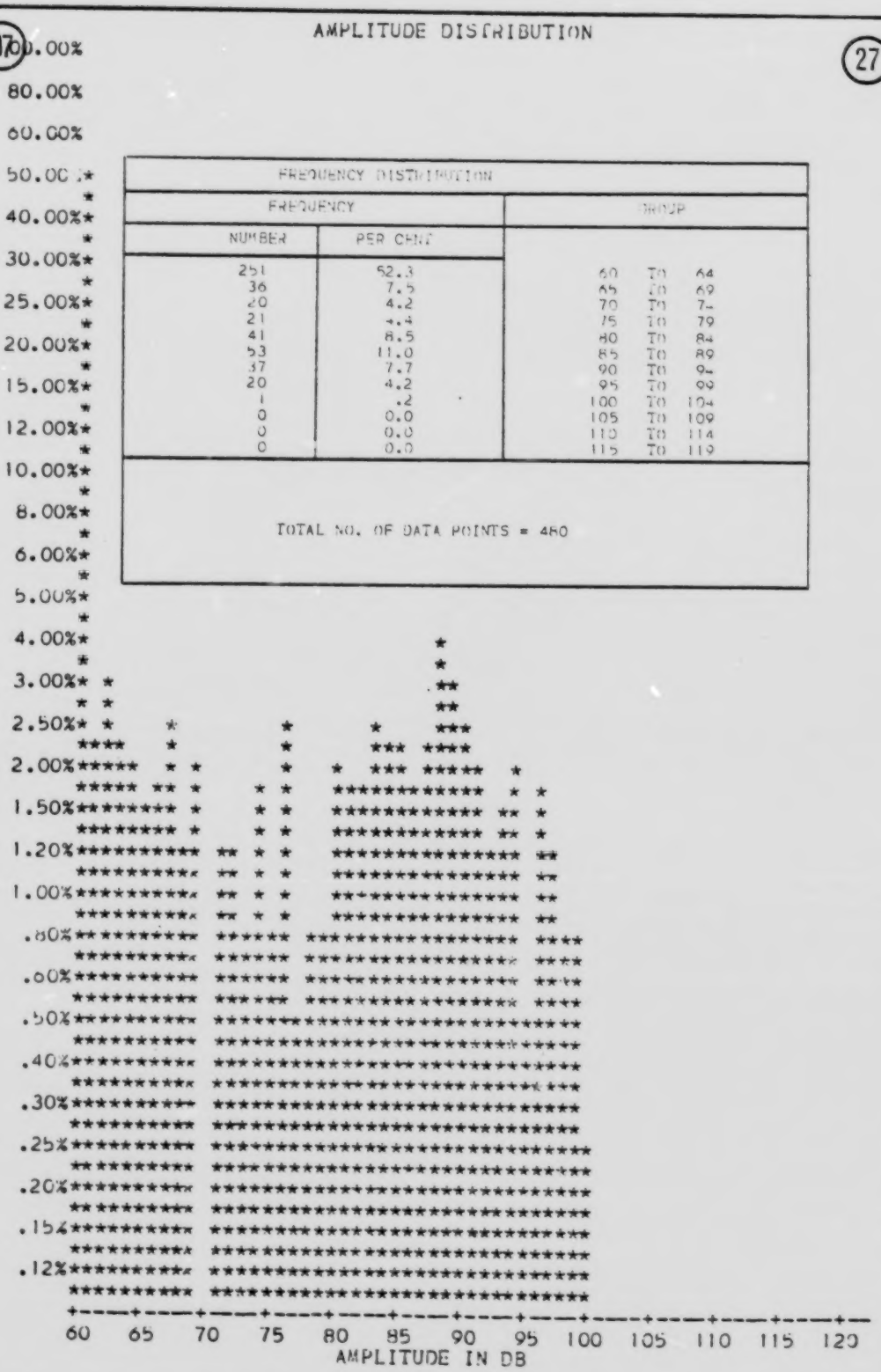
MIN. COMP. = 60 DB MAX. COMP. = 103 DB
ARITHMETIC MEAN = 70 DB
STD. DEVIATION = 13 DB
VARIANCE =169 DB

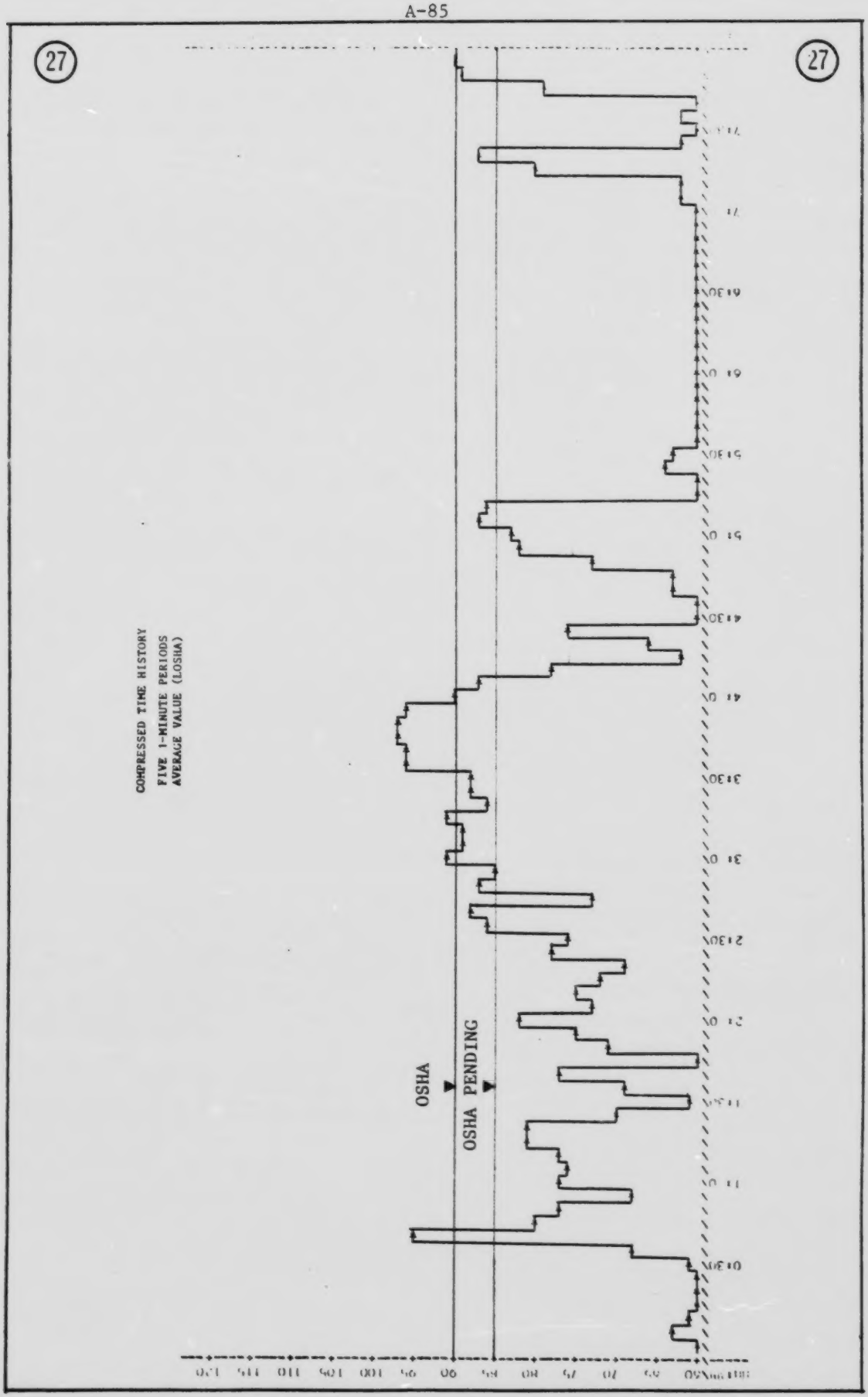
AMPLITUDE DISTRIBUTION

(27) (27)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
251	52.3	60 TO 64
36	7.5	65 TO 69
20	4.2	70 TO 74
21	4.4	75 TO 79
41	8.5	80 TO 84
53	11.0	85 TO 89
37	7.7	90 TO 94
20	4.2	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




27
27
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(28)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
   1  26  80  1212   60   64    4    1
    37340      91317  380
   60  60  60  68  72  65  69  65  60  60  61  60  60  60  60  60
   62  65  61  60  70  60  60  60  60  60  60  60  60  60  60  60
   69  71  74  80  80  88  99  84  86  89  92  92  83  85  88  75
   96  86  67  61  60  60  62  60  60  60  60  70  60  63  60  62
   52  85  61  65  60  63  60  60  64  65  70  62  60  60  82  60
   60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  62
   74  81  60  [illegible]  60  80  [illegible]  73  95  95  73  74  75  94  77  71
   64  63  [illegible]  95  77  61  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
   60  60  60  60  60  60  60  61  60  60  60  60  60  60  60  60
   60  60  60  60  60  60  60  62  60  60  60  60  60  60  60  60
   60  60  [illegible]  92  92  92  93  93  91  93  [illegible]  [illegible]  89  83  87  90
   97  87  [illegible]  60  60  60  67  62  60  60  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
   60  60  60  62  60  61  64  61  60  60  63  60  60  60  60  67
   60  62  62  60  64  64  62  60  67  66  60  62  63  67  62  63
   64  63  66  74  61  66  61  65  63  61  [illegible]  62  71  62  71  62
   60  61  60  64  67  73  72  61  60  60  60  60  60  60  60  60
   71  72  67  64  76  79  64  63  68  60  73  71  71  60  63  65
   60  66  60  60  61  60  61  64  64  60  61  60  60  62  60  63
   65  75  78  95  94  83  81  86  84  92  91  95  94  95  95  89
   94  95  96  95  94  97  93  97  96  96  84  87  94  92  86  86
   89  89  82  87  86  79  74  74  73  82  86  85  81  85  90  84
   90  87  79  81  70  77  83  68  6[illegible]  67  72  73  76  65  71  [illegible]
   60  60  60  60  60  60  64  60  60  76  69  60  60  60  60  72
   69  60  60  65  73  60  60  62  73  70  63  62  60  60  60  60
   60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
   60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
   60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
   60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
   60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
   60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
%EOF
```

(28)

ENTER LOG DATE (DD/MM/YR) : 23/08/79

ENTER SITE CODE (5 CHARS) : 36950

ENTER USER CODE (4 CHARS) : 4135

ENTER JOB CODE (3 CHARS) : 240

DATA LOGGED :23 AUG 1979
LOGGER : 08-301/26
SERIAL NUMBER : 1212
LABELLING : 60 DB
DYNAMIC RANGE : 24 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 6:20:29

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 36950
JOB CODE : 240
USER CODE : 4135
THRESHOLD : [illegible] DB
TOTAL SAMPLES = 91317
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

[illegible] EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
[illegible] = [illegible] / [illegible]
EXCHANGE (DOUBLING) RATE = [illegible]
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 380
PERIOD = 1 MINUTES

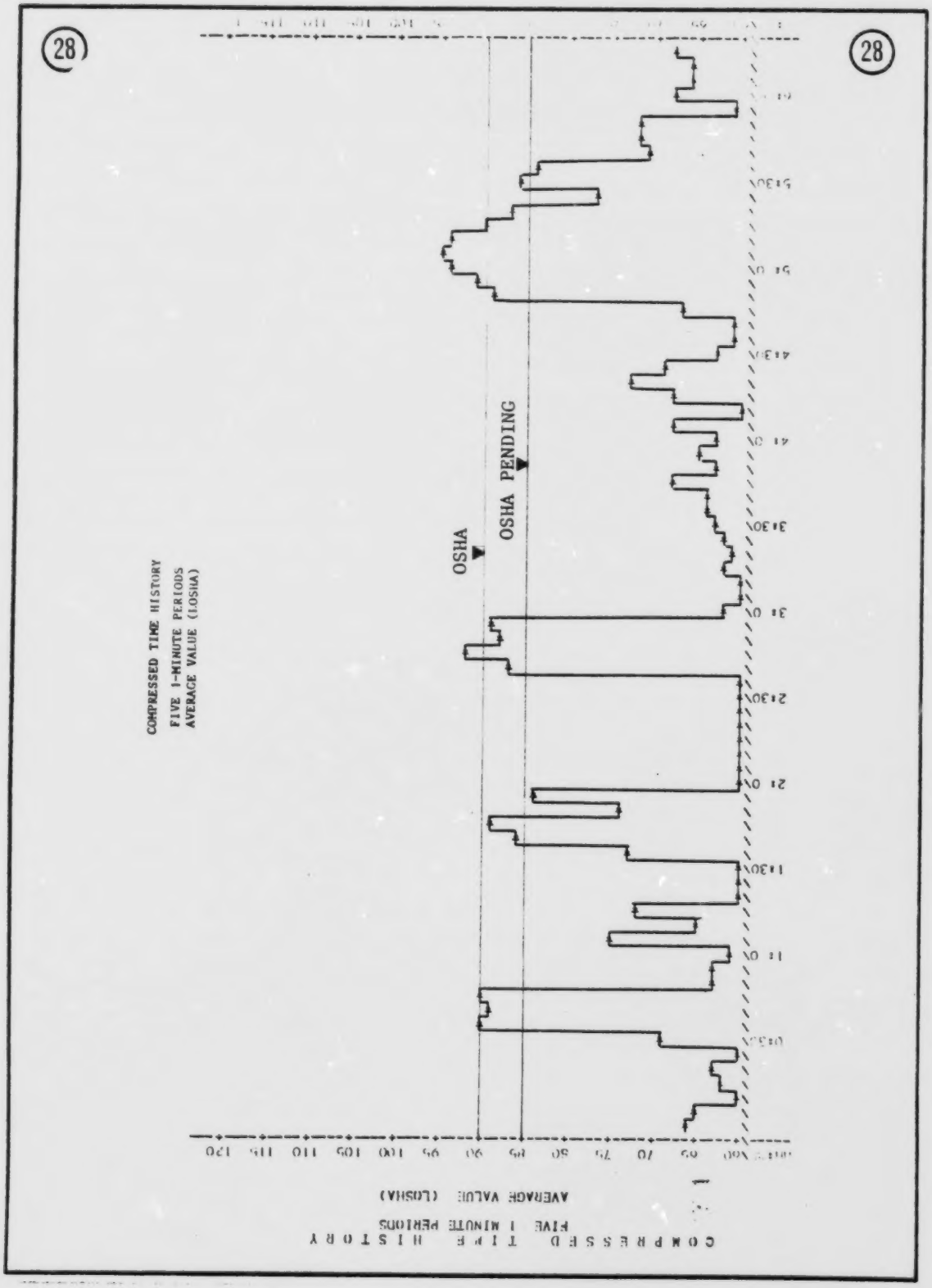
TIME	LOGIX		[illegible]	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	60.4	60.4	3.300	3.30
2	70.2	74.4	2.434	5.74
3	61.4	69.1	3.803	9.54
4	63.1	68.3	.499	9.04
5	78.4	78.3	2.498	12.34
6	67.7	71.0	9.134	21.47
7	67.0	80.6	.172	21.64

MIN. COMP. = 60 DB MAX. COMP. = 99 DB
ARITHMETIC MEAN = 68 DB
STD. DEVIATION = 12.03
VARIANCE =144 DB

28 AMPLITUDE DISTRIBUTION 28

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
287	67.4	60 TO 64
31	7.3	65 TO 69
25	5.9	70 TO 74
11	2.6	75 TO 79
14	3.3	80 TO 84
19	4.5	85 TO 89
22	5.2	90 TO 94
17	4.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


28
28
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
AVERAGE VALUE (LOSHA)
FIVE 1 MINUTE PERIODS
COMPRESSED TIME HISTORY

(29)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(29)

```
  1  26  80  1217   60   64    4    1
     71      115200  480
 63  60  60  66  60  60  60  62  68  66  60  72  70  73  67  63
 60  60  61  60  61  67  67  61  65  73  75  60  60  62  62  60
 66  67  65  70  64  60  60  60  60  60  60  60  61  65  69  63
 64  66  60  61  60  74  78  76  83  79  90  89  93  81  86  85
 84  87  79  68  60  84  80  60  78 101  92  79  90  91  86  93
 66  92  88  93  92  84  85  83  77  93  90  81  83  72  68  75
 66  60  66  91  76  71  78  60  64  61  61  61  65  64  64  69
 70  87  92  77  61  61  67  60  62  61  61  67  66  63  61  60
 60  60  62  63  67  63  62  60  62  63  60  62  70  62  69  60
 63  60  62  61  64  71  65  69  75  60  60  69  61  63  77  72
 75  62  74  64  70  72  64  71  71  75  67  83  76  77  74  65
 78  79  62  66  60  60  60  60  60  61  63  65  61  60  62  60
 60  60  60  61  60  62  62  61  60  61  68  74  61  60  62  60
 83  78  80  84  84  82  87  86  84  60  71  88  86  90  96  86
 63  80  96  97  82  60  74  86  87  66  75  75  76  64  67  62
 60  76  67  60  85  90  82  73  60  67  61  68  60  60  63  69
 81  74  66  79  68  74  73  66  60  62  62  60  62  81  64  60
 69  70  77  60  65  61  80  75  64  63  60  60  67  65  68  62
 62  60  71  66  68  89  91  97  95  95  96  96  95  98  93  92
 96 100  97  92  92  94 101 100  92  96  96  85  87  81  86  85
 76  81  75  82  82  83  77  75  75  66  79  68  72  83  82  78
 82  73  75  69  73  76  65  71  89  95  95  95  96  89  93  91
 89  89  95  96  99 100 103  98  97  90  81  83  85  84  86  91
 83  83  92  93  92  85  83  94 100 104 102  95  83  90  94  95
 95  98  96  86  86  81  63  72  70  61  75  84  83  66  66  83
 74  85  85  90  93  87  77  79  80  79  82  81  79  79  80  77
 83  63  62  60  60  60  69  82  80  82  87  85  89  85  84  88
 85  86  85  85  85  85  85  94  97  80  84  93  93  87  90  96
 89  88  84  92  94  87  92  89  91  87  88  88  92  87  75  74
 77  76  83  73  75  85  76  86  86  89  81  82  82  95  94  93
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 22/08/79
ENTER SITE CODE (5 CHARS) : 31950
ENTER USER CODE (4 CHARS) : 4213
 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :22  AUG 1979          DATA ANALYZED : 25 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 31950
SERIAL NUMBER : 1217                       JOB CODE : 240
     BASELINE : 60 DB                     USER CODE : 4213
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  11520
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0:17
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		MINTE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIV
1	71.4	71.4	.940	.95
2	64.7	80.8	6.033	6.98
3	70.1	78.7	.796	7.77
4	60.9	79.3	3.545	11.32
5	81.4	79.8	3.779	15.10
6	91.9	83.7	16.202	31.30
7	69.4	84.8	11.504	42.81
8	87.7	89.3	9.090	51.90

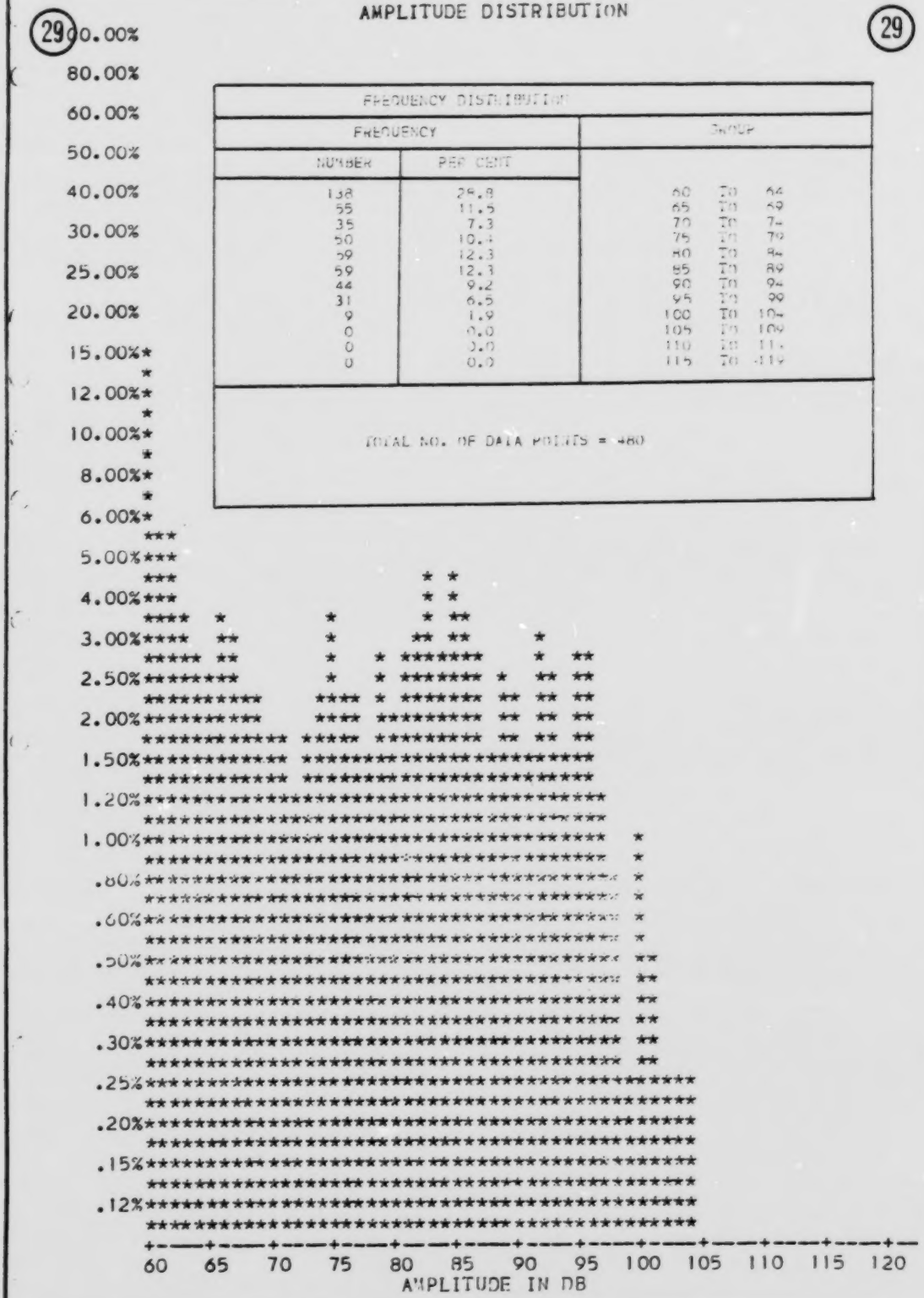
```
MIN. COMP. =  60 DB                MAX. COMP. = 104 DB
ARITHMETIC MEAN =  75 DB
STD. DEVIATION =  12 DB
VARIANCE =144 DB
```

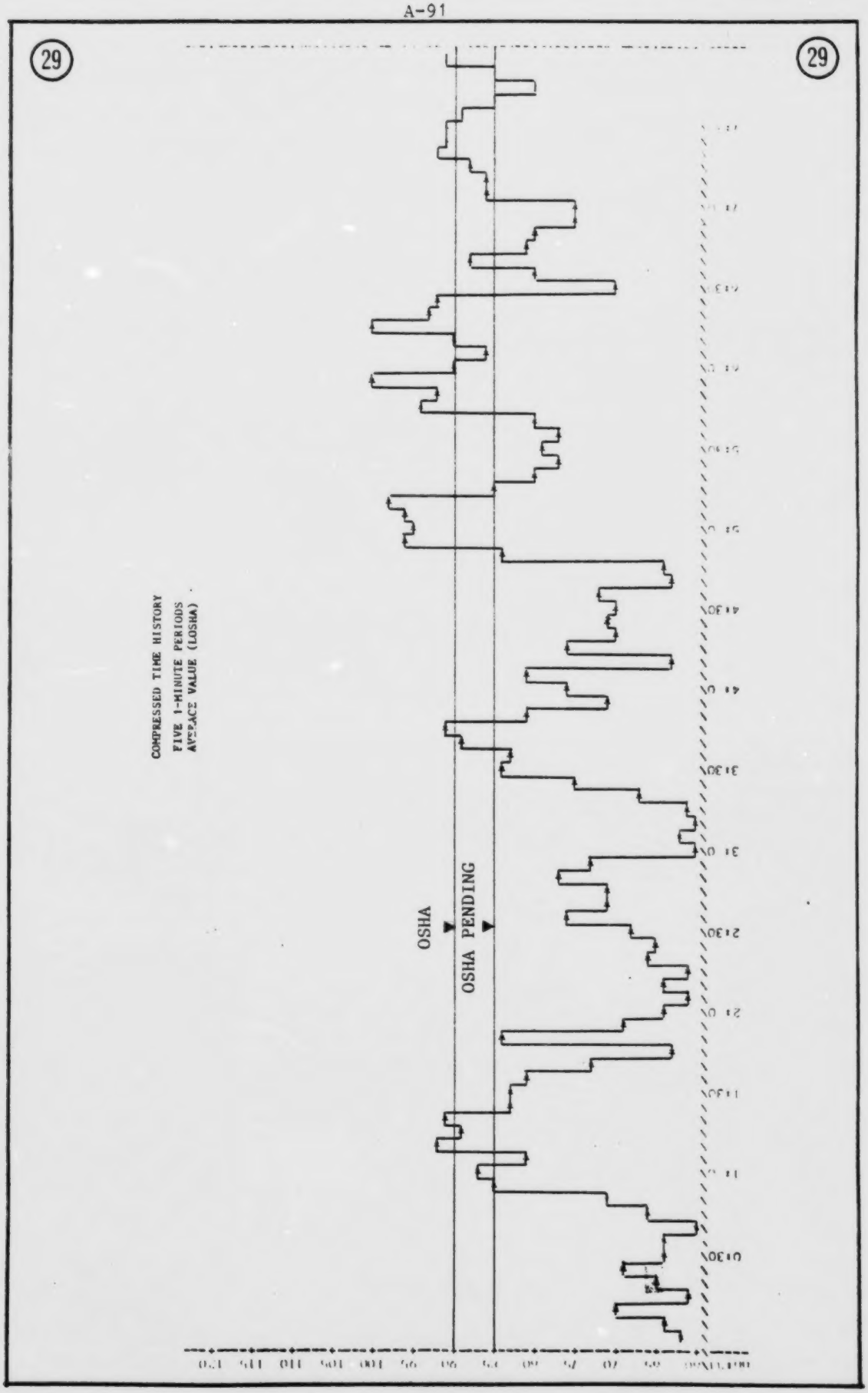
AMPLITUDE DISTRIBUTION

(29) (29)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
138	28.8	60 TO 64
55	11.5	65 TO 69
35	7.3	70 TO 74
50	10.4	75 TO 79
59	12.3	80 TO 84
59	12.3	85 TO 89
44	9.2	90 TO 94
31	6.5	95 TO 99
9	1.9	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




29
29
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(30)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1220    60    64     4     1
     42      115200   480
 63  65  70  62  63  65  60  60  60  60  60  60  60  60  60  63
 60  60  60  60  66  68  63  60  64  63  60  60  60  60  74  78
 78  82  82  88  91  89  87  92  91  94  88  83  94  80  95  97
 84  82  70  73  76  80  79  80  75  76  73  70  60  74  81  85
 85  65  70  66  68  75  74  69  70  72  71  60  81  85  66  67
 66  75  73  63  64  66  66  65  71  70  66  67  75  72  77  75
 77  60  68  77  77  91  82  97  96  77  77  75  85  92  75  78
 70  70  76  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  66  66  60  66  60  63  60  61  65  60  61
 60  60  60  60  60  60  60  61  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  67  61  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  69  60  74  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  67  61  71  69  97  100  96  84  89  91  86  93  94
 90  87  60  75  90  92  81  90  81  77  86  93  90  95  94  89
 82  80  83  77  89  89  94  91  93  93  86  93  92  94  93  91
 93  89  93  92  92  82  91  94  91  91  91  94  92  85  94  90
*EOF
```

(30)

```
ENTER LOG DATE (DD/MM/YR) : 23/08/79
ENTER SITE CODE (5 CHARS) : 36950
ENTER USER CODE (4 CHARS) : 4281
 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :23  AUG 1979          DATA ANALYZED : 25 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 36950
SERIAL NUMBER : 1220                       JOB CODE : 240
     BASELINE : 60 DB                    USER CODE : 4281
DYNAMIC RANGE : 64 DB                    THRESHOLD : 90 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 11520
TEST DURATION =  48 HR 0             STANDBY TIME =  0: 2:10
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
CRITERION (ACCEPTABLE) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 90 DB
NUMBER OF OBSERVATIONS = 690
PERIOD = 1 MINUTES

TIME	LEQ(A)		DOSE	
CODE	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	61.2	61.2	.332	.33
2	60.4	61.2	3.283	7.33
3	60.0	75.4	.217	7.55
4	60.6	75.5	.211	7.76
5	61.0	75.2	.243	7.99
6	60.0	74.0	.195	8.18
7	60.2	73.1	.201	8.38
8	90.6	79.1	13.243	21.63

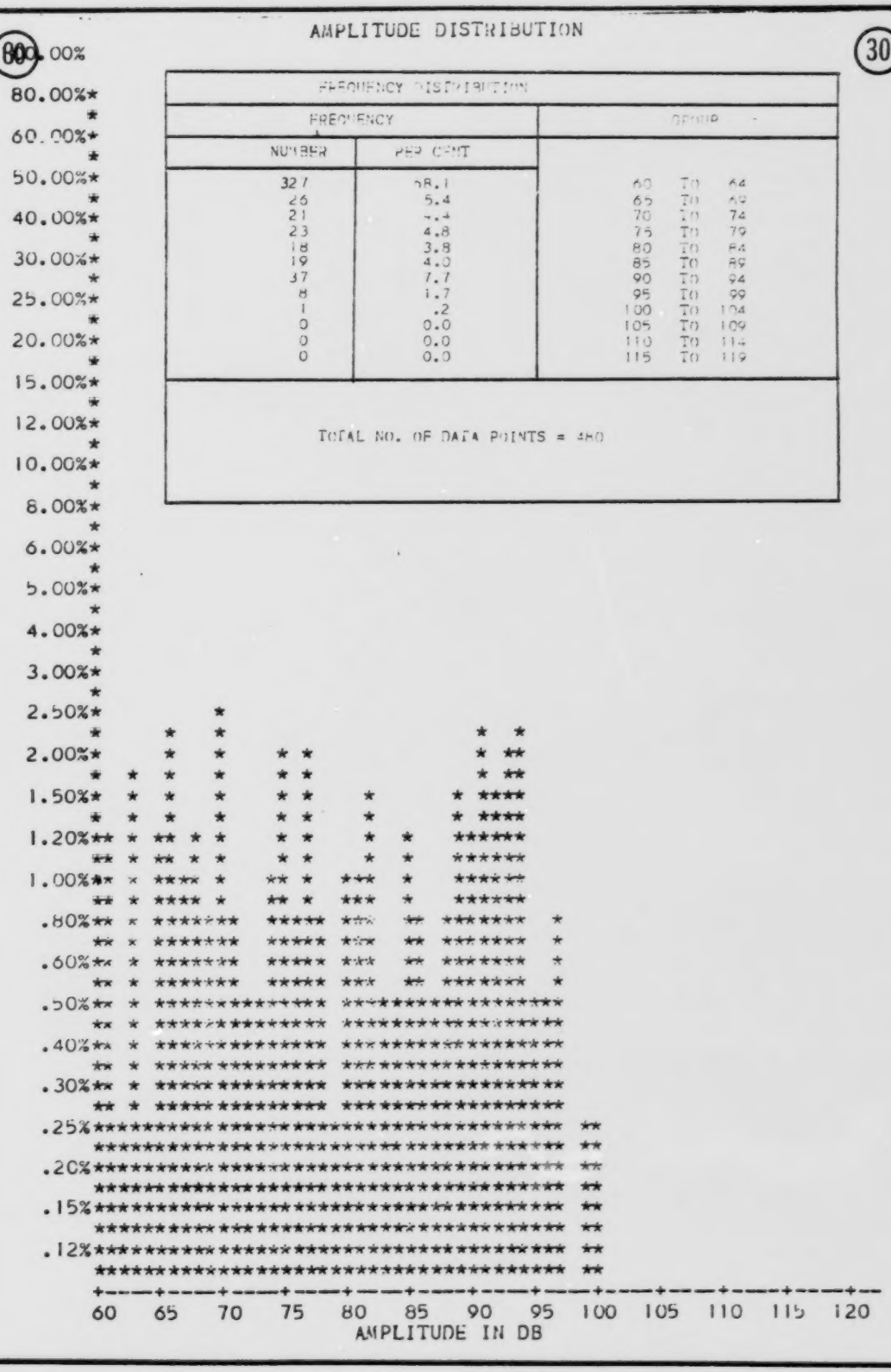
MIN. COMP. = 60 DB MAX. COMP. = 100 DB
ARITHMETIC MEAN = 66 DB
STD. DEVIATION = 11 DB
VARIANCE =121 DB

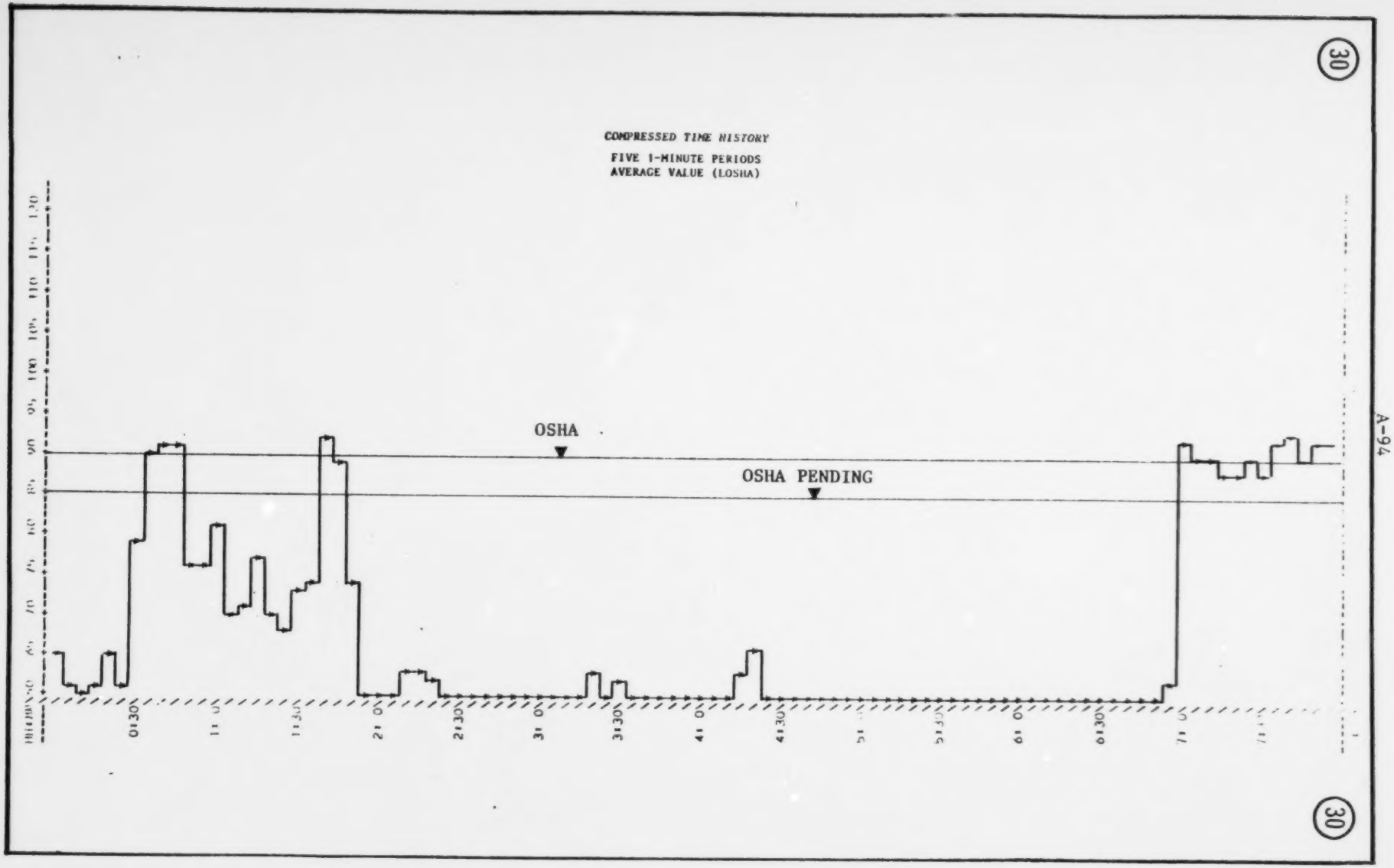
AMPLITUDE DISTRIBUTION

(80) (30)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
327	68.1	60 TO 64
26	5.4	65 TO 69
21	4.4	70 TO 74
23	4.8	75 TO 79
18	3.8	80 TO 84
19	4.0	85 TO 89
37	7.7	90 TO 94
8	1.7	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




30
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
30

(31)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1219    60    64     4     1
     146     115200  480
  72  60  60  60  60  60  60  75  66  69  64  60  77  74  61  60
  60  66  65  65  66  61  63  71  78  72  73  67  70  62  72  79
  77  76  85  87  85  70  73  71  62  68  63  65  61  62  75  72
  77  83  88  96  87  89  95  87  80  89  86  85  88  90  92  89
  89  77  81  84  84  87  89  86  86  73  75  84  86  88  89  92
  86  66  60  60  60  60  60  60  65  67  65  65  67  73  76  71
  68  75  68  74  73  71  62  72  71  69  69  68  68  69  68  66
  63  69  70  72  74  74  67  84  85  85  87  86  94  95  80 101
 105  98 113 112 113 114 108  85 111 111 103 112 109 108 107 106
 109 111 110 111 110  99  83  87  86  87 104 114  95 117 115  84
 103 103 110  84  86  84  85  85  89  93 100 118 117 104 103 117
 114 118 115  74  80  73  83  83  83  75  71  73  73  71  75  78
  72  73  72  73  72  76  70  70  41  77  69  71  74  70  68  68
  65  75  84  83  80  98  87  87  82  80  83  93  83  86  84  79
  66  77  74  60  63  61  77  81  86  82  71  69  76  65  68  69
  61  60  65  77  83  86  84  80  65  63  75  83  78  60  79  76
  70  70  66  73  68  72  72  77  78  75  72  69  76  78  73  78
  80  80  78  77  78  79  79  79  78  79  80  79  81  89  81  80
  80  80  80  80  80  80  79  80  80  80  80  80  80  80  80  80
  80  80  80  80  80  80  83  82  88  85  72  82  76  78  62  68
  60  60  74  82  71  84  73  86  78  72  76  78  77  73  77  80
  86  88  83  73  75  80  76  78  75  73  80  77  79  60  68  73
  71  74  74  70  61  73  81  88  83  78  67  69  62  69  70  61
  60  62  61  60  65  60  66  60  60  60  60  60  80  75  74  78
  76  60  60  68  77  76  75  86  91  87  89  88  85  98  90  91
  88  90  87  94  96  93  93  96  89  90  90  86  77  65  82  70
  72  70  74  74  71  69  67  61  62  60  65  71  60  60  60  60
  60  60  60  60  60  69  69  68  60  60  60  60  60  60  60  60
  60  60  60  70  68  74  66  61  60  60  60  67  71  64  60  62
  60  63  60  60  60  60  60  60  65  60  60  61  60  60  70  74
%EOF


ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 95400

ENTER USER CODE (4 CHARS) : 4123
 ENTER JOB CODE (3 CHARS) : GCS


   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DS-301/26                 SITE CODE : 95400
SERIAL NUMBER : 1219                       JOB CODE : GCS
     BASELINE : 60 DB                     USER CODE : 4123
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:26

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LEQ(A                          DOSE
HOUR    CURRENT  CUMULATIVE          CURRENT  CUMULATIVE
   1       79.9       79.9            3.095        3.09
   2       80.5       80.2            3.358        6.45
   3      108.3      100.4          151.880      158.33
   4       79.1       98.4            2.773      161.10
   5       78.3       96.9            2.489      163.59
   6       78.8       95.7            2.660      166.25
   7       84.0       94.9            5.412      171.66
   8       64.3       93.9             .365      172.02
MIN. COMP. =  60 DB                MAX. COMP. = 118 DB
ARITHMETIC MEAN =  76 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```

(31)

AMPLITUDE DISTRIBUTION

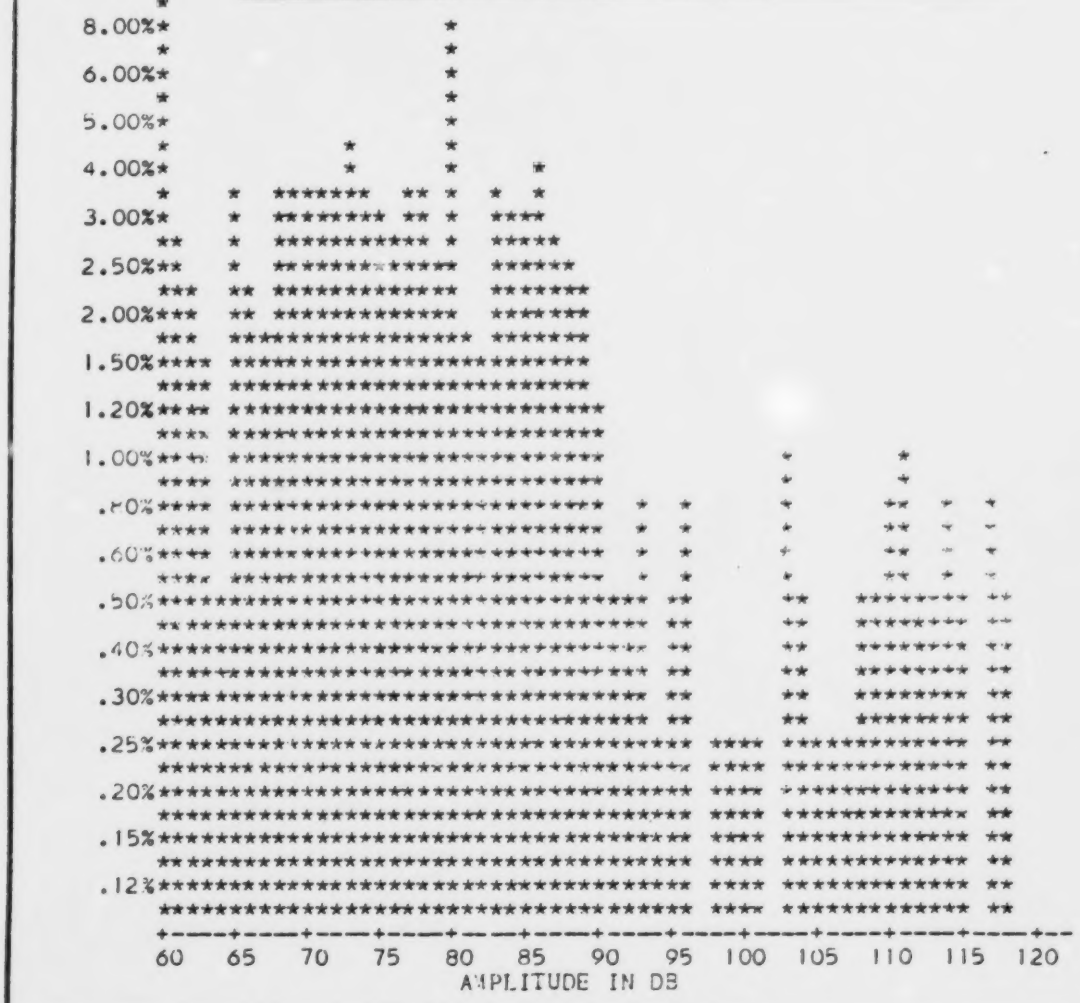
30

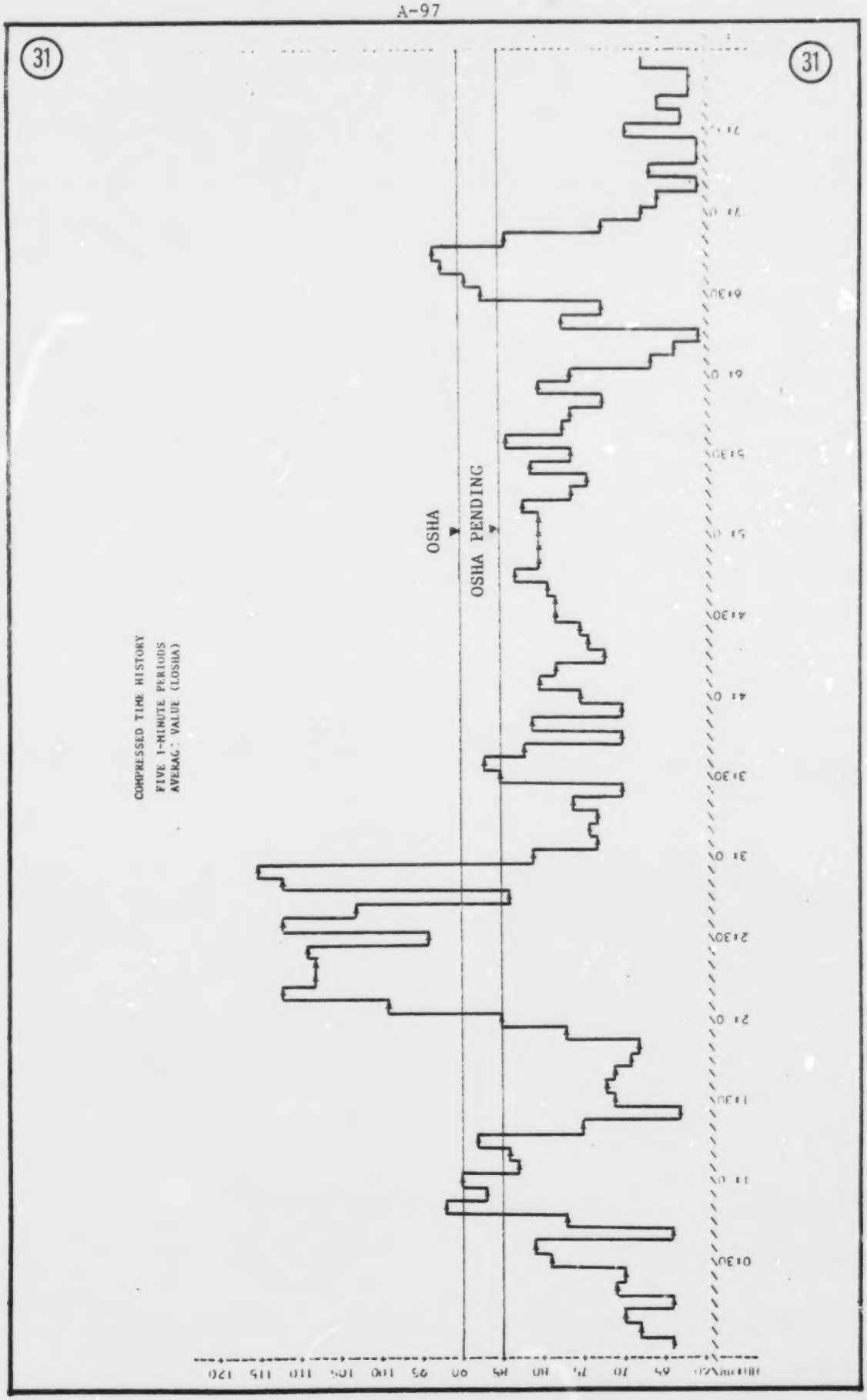
31

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
95	19.8	60 TO 64
59	12.3	65 TO 69
76	15.8	70 TO 74
64	13.3	75 TO 79
72	15.0	80 TO 84
58	12.1	85 TO 89
13	2.7	90 TO 94
7	1.5	95 TO 99
8	1.7	100 TO 104
7	1.5	105 TO 109
14	2.9	110 TO 114
7	1.5	115 TO 119

TOTAL NO. OF DATA POINTS = 480




31
31
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAG VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00

(32)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225   60   64    4    1
      81      115200  480
 69  61  60  60  62  60  60  60  60  60  68  65  74  74  69  60
 60  60  60  61  60  60  60  60  60  62  60  60  62  78  88  91
 90  93  89  90  96  91  93  87  87  84  83  87  89  90  89  94
 91  90  90  90  99  96  92  95  93  91  87  75  80  92  88  98
 93  87  82  63  84  64  63  61  64  64  62  66  60  69  84  84
 76  76  63  60  75  87  91  83  86  93  93  96  97  86  86  90
 92  88  89  75  67 103 102  84  95 107 103 103 113  99 107  99
106 109 104 110 106  91  90  90  65  77  80  71  71  63  65 104
107 102 101  62  96 110 113 111 109  97  67  82  94  79  84  88
 60  80  85  60  69  92  96  88  76  73  62  60  60  60  60  63
105  98 101 107  94 105 100 106  90 102 107  97  90 105 108  93
 60 105 107  73  67  61  68  64  80  60  60  60  60  60  69  60
 60  60  60  60  67  82  74  86  90  94  88  88  83  82  81  84
 84  85  85  84  85  84  84  80  84  84  85  85  86  86  93  98
 97 100  99 102 100  93  93  99  99  99  99  96  95  86  83  83
 83  84  83  83  83  83  90  95 101  98  99  98  99 100  95 101
100  97  94  82  81  80  66  60  60  60  60  60  60  61  60  60
 60  60  60  60  60  71  64  67  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  67  62  60  60  60  66  64  71  69
 63  60  60  63  63  60  60  61  60  61  67  60  60  61  60  60
 60  65  66  91  80  68  73  87  90  88  86  83  67  63  89  96
 93  60  65  78  70  73  63  60  60  61  60  63  64  68  66  68
 70  60  62  60  60  60  60  60  75  70  60  60  69  71  66  73
 81  83  88  88  87  87  87  87  87  87  87  87  88  88  87  88
 87  88  87  87  87  86  87  87  86  88  87  87  87  89  89  92
 88  88  89  89  89  89  89  90  88  87  75  71  74  81  76  66
 75  68  73  73  69  80  83  81  81  83  76  77  79  82  82  80
 85  79  76  87  81  67  60  60  60  67  61  60  60  60  60  60
 60  60  64  60  60  61  75  71  75  60  64  60  60  65  60  60
 62  60  63  79  70  77  75  80  81  77  74  75  75  74  76  71
%EOF
```

(32)

```
ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 7474

 ENTER JOB CODE (3 CHARS) : GCS
```

```
   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 00000
SERIAL NUMBER : 1225                        JOB CODE : GCS
      BASELINE : 60 DB                     USER CODE : 7474
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0            STANDBY TIME =   0: 0:20
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOOL DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.3	86.3	7.501	7.50
2	96.1	92.7	28.980	36.48
3	99.5	95.7	46.513	82.99
4	89.9	94.7	12.308	95.30
5	87.1	93.7	9.070	104.37
6	78.2	92.5	2.420	106.79
7	85.5	91.9	6.657	113.45
8	75.2	91.0	1.602	115.05

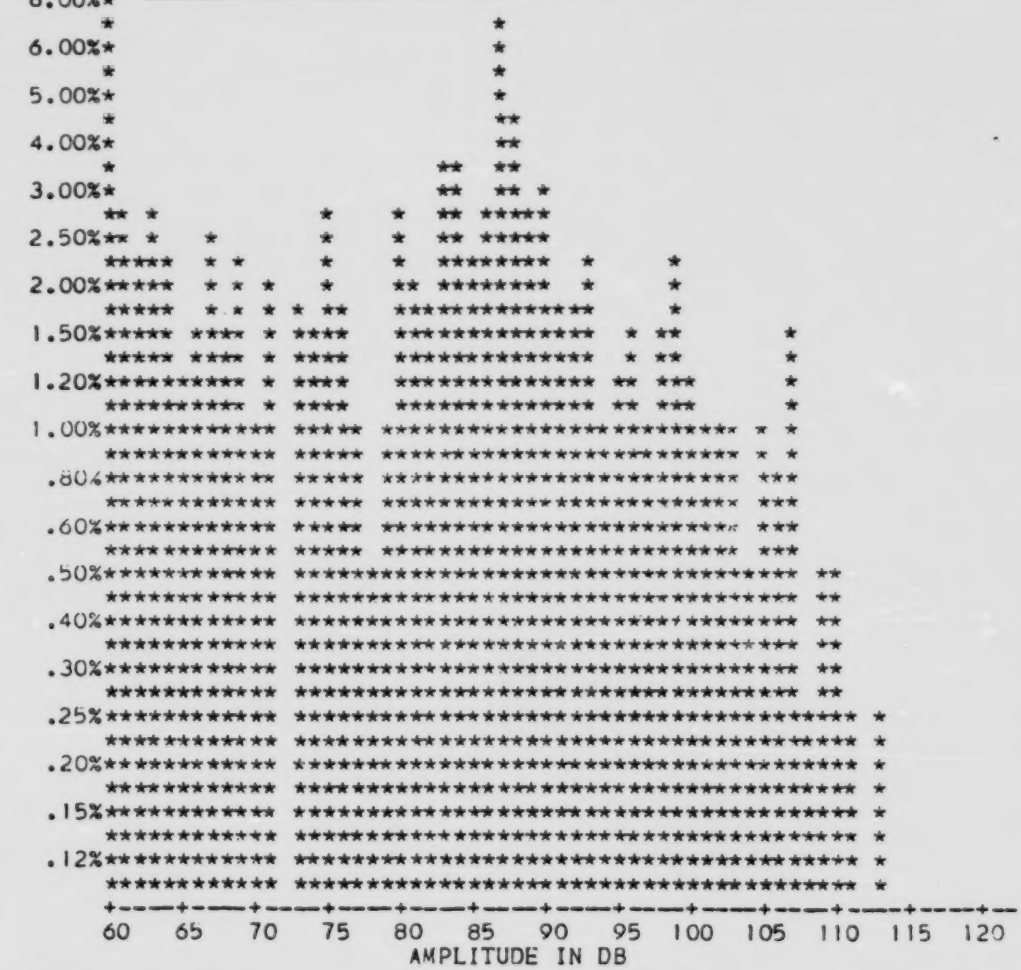
```
MIN. COMP. =  60 DB                MAX. COMP. = 113 DB
ARITHMETIC MEAN =  77 DB
STD. DEVIATION =  15 DB
VARIANCE =225 DB
```

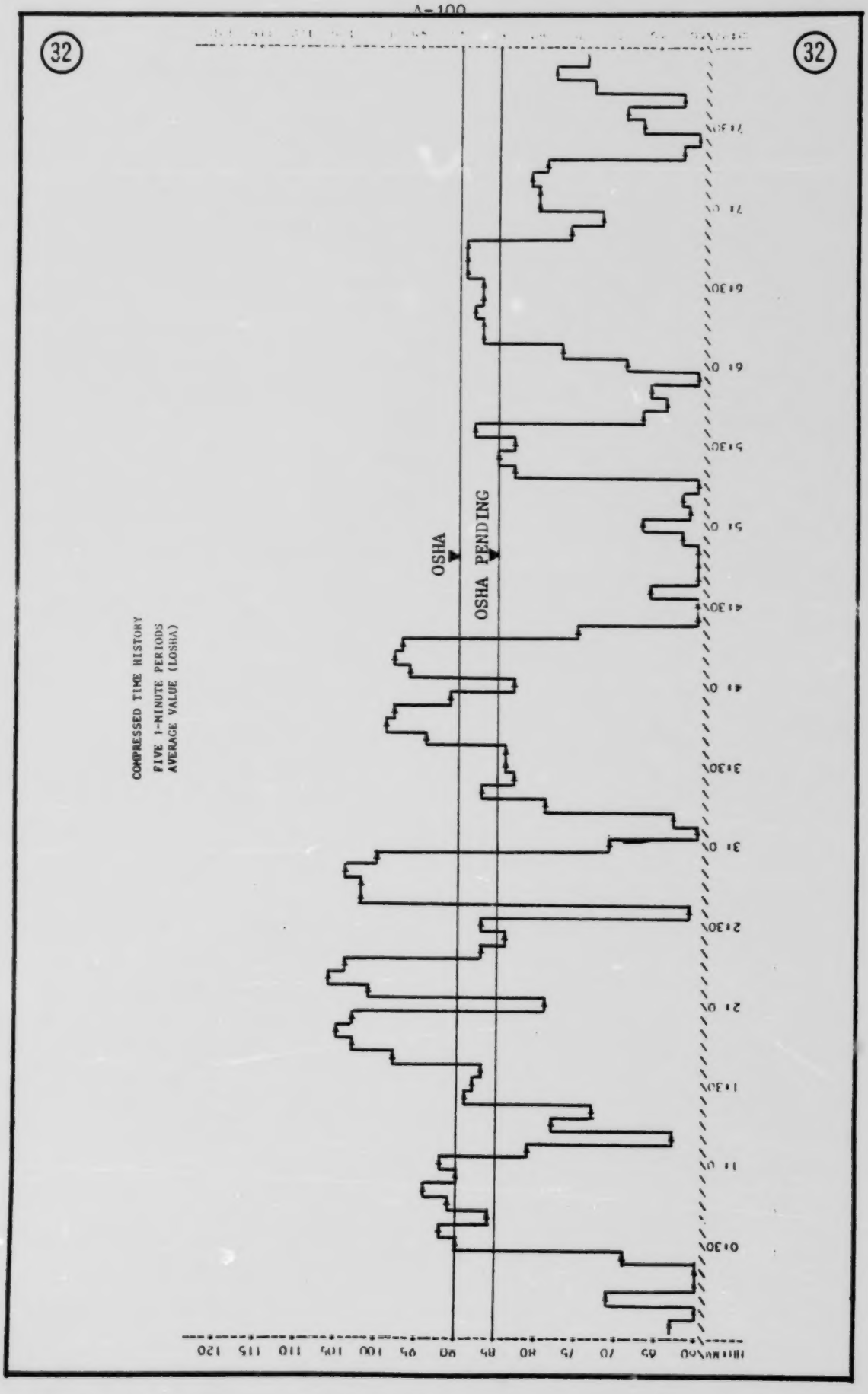
AMPLITUDE DISTRIBUTION

(32) (32)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
150	31.3	60 TO 64
36	7.5	65 TO 69
25	5.2	70 TO 74
28	5.8	75 TO 79
55	11.5	80 TO 84
77	16.0	85 TO 89
40	8.3	90 TO 94
30	6.3	95 TO 99
19	4.0	100 TO 104
16	3.3	105 TO 109
4	.8	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




32
32
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dBA re 20 μPa
60
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(33)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1216   60   64    4    1
     116     115200  4H0
  60  62  62  67  68  67  77  72  69  62  65  61  65  74  70  68
  62  60  60  60  60  60  70  79  78  72  80  83  62  78  81  98
  90  96  92  78  60  66  63  60  70  86  77  84  64  79  72  79
  82  86  85  87  85  86  86  87  91  97  93  88  96  87  81  88
  81  81  86  98  82  82  79  81  81  69  62  72  77  89  80  86
  89  88  93  81  81  82  83  82  82  82  83  82  91  85  81  84
  85  81  79  75  83  76  88  93  90  92  90  93  89  98  85  86
  85  86  87  83  78  91  91  90  89  90  90  90  89  89  91  91
  90  90  93  92  93  92  91  75  86  95  84  84  84  94  84  80
  78  60  67  66  60  66  60  61  60  60  60  60  62  60  60  60
  60  60  60  60  60  60  65  68  76  77  81  75  73  70  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  61  60  60
  60  60  60  60  62  60  60  60  63  60  60  60  65  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  62  60  60
  60  61  82  71  60  60  60  60  60  60  60  60  60  60  60  69
  74  60  83  85  72  60  60  83  85  83  86  85  85  86  85  86
  84  81  72  78  68  60  60  60  60  60  72  74  60  60  60  60
  60  73  64  65  60  60  60  72  81  68  60  60  60  61  60  60
  60  65  60  60  77  60  60  68  60  60  69  70  70  60  60  60
  60  60  60  60  60  60  63  60  60  60  61  60  60  74  68  60
  60  60  60  64  61  60  65  60  60  61  60  68  61  60  60  60
  60  60  60  60  61  64  60  60  60  74  70  66  63  68  66  78
  74  61  60  60  78  66  60  60  60  60  60  60  61  64  69  60
  66  70  70  79  62  67  64  65  87  81  83  79  71  60  61  65
  61  70  74  70  60  60  60  65  64  72  77  77  61  66  65  61
  61  68  60  60  62  71  83  83  83  78  62  70  60  60  62  60
  60  60  60  60  74  63  82  86  87  89  92  92  87  87  87  85
  87  88  92  89  86  87  71  64  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  69  71  71  64  63  60  65
%EOF
```

(33)

```
ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 40954
ENTER USER CODE (4 CHARS) : 4166
 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :26 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 40954
SERIAL NUMBER : 1216                       JOB CODE : 240
     BASELINE : 60 DB                     USER CODE : 4166
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0:29
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

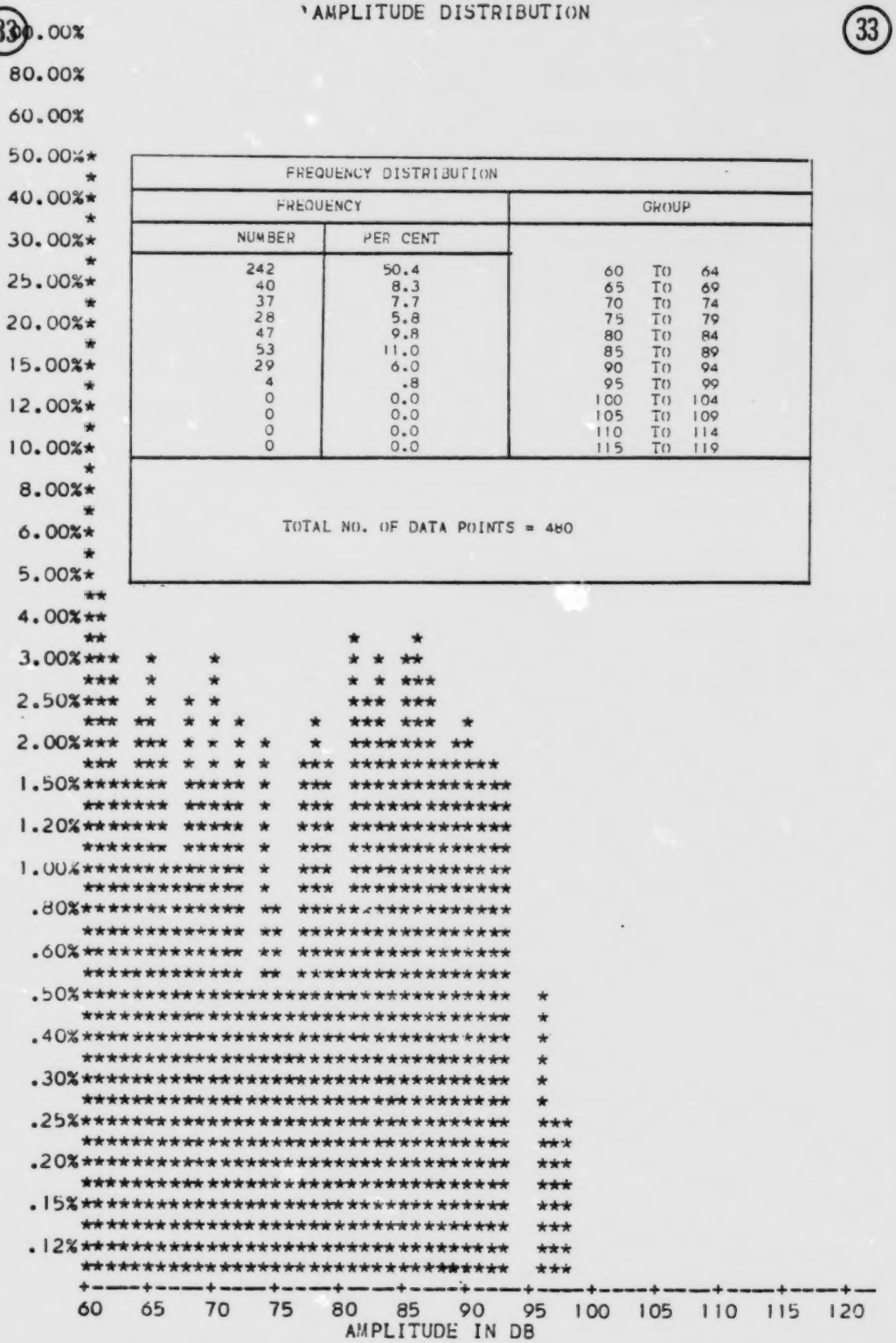
TIME	LOGIA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	83.0	83.0	4.735	4.74
2	86.1	84.7	7.279	12.01
3	82.8	84.1	4.582	16.60
4	60.3	82.1	.203	16.80
5	75.7	81.2	1.729	18.53
6	63.3	80.0	.309	18.84
7	70.9	79.3	.687	19.72
8	79.9	79.3	3.087	22.81

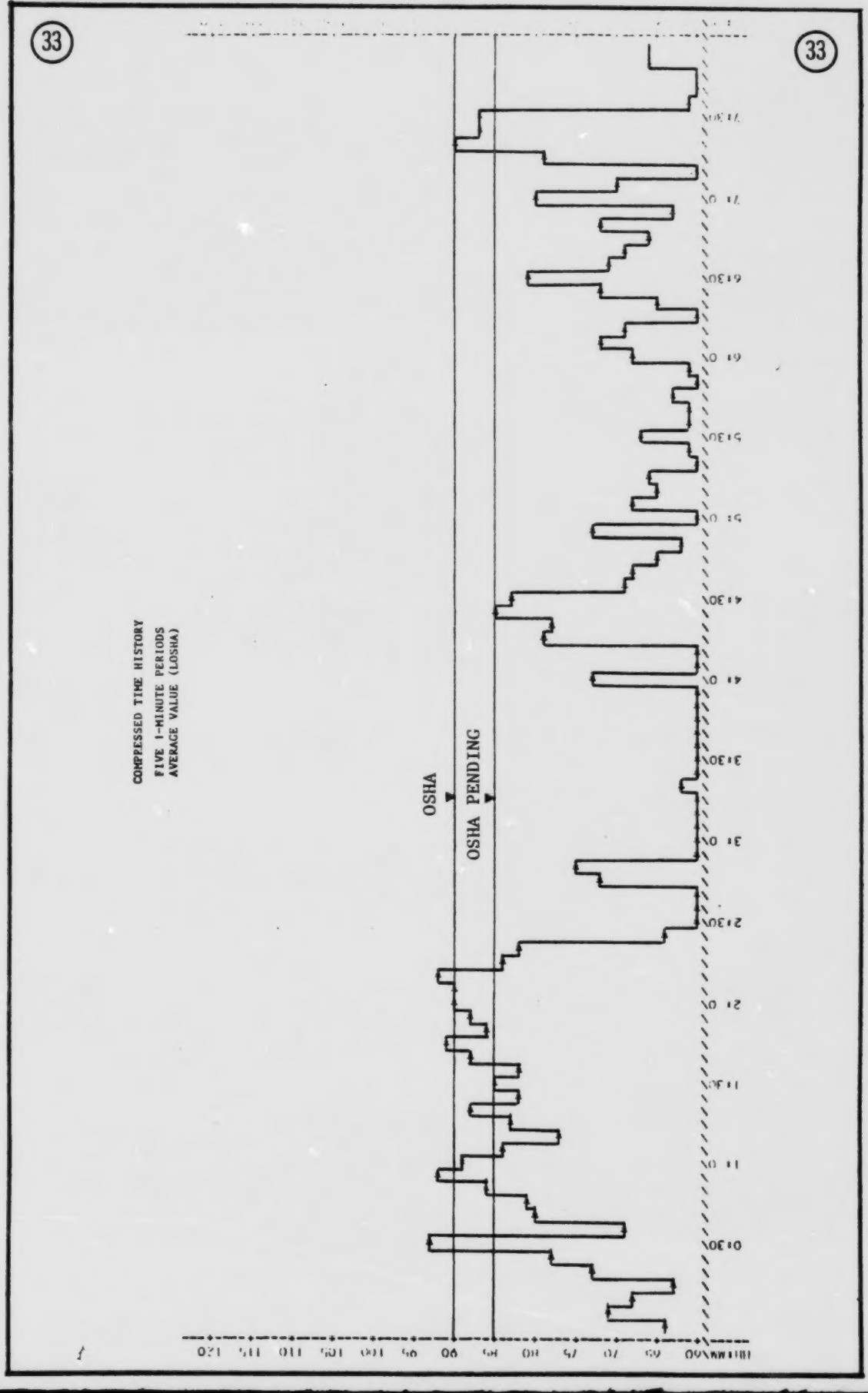
MIN. COMP. = 60 DB MAX. COMP. = 98 DB
ARITHMETIC MEAN = 70 DB
STD. DEVIATION = 11 DB
VARIANCE =121 DB

33 AMPLITUDE DISTRIBUTION 33

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
242	50.4	60 TO 64
40	8.3	65 TO 69
37	7.7	70 TO 74
28	5.8	75 TO 79
47	9.8	80 TO 84
53	11.0	85 TO 89
29	6.0	90 TO 94
4	.8	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




33
33
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dBA
60
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(34)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1221    60    64     4     1
     525     115200   480
  66  71  83  85  65  70  63  64  63  66  68  71  68  68  65  60
  60  62  60  67  68  74  79  74  84  82  84  80  82  85  84  83
  83  83  83  82  83  82  83  82  84  86  83  82  83  84  83  83
  82  84  83  84  85  85  95  90  91  97  94  84  86  85  85  88
  87  86  86  92  95  86  91  84  84  87  95  98  86  85  90  89
  95  85  86  86  88  85  84  83  83  86  93  84  80  86  84  82
  81  80  79  77  87  93  92  92  93  93  90  90  87  88  85  85
  88  86  89  91  92  93  92  91  92  91  90  90  90  90  90  90
  90  90  92  92  94  86  90  89  90  88  89  89  88  85  85  85
  87  87  87  87  87  87  87  87  87  87  85  89  85  60  61  87
  87  87  87  88  89  88  88  88  88  88  86  85  60  60  60  62
  60  60  65  60  60  60  61  60  61  60  60  61  60  60  60  60
  60  63  60  60  60  62  65  63  64  60  64  60  60  67  61  60
  64  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  64  61  60  64  64
  60  60  64  64  63  60  60  61  60  60  60  60  60  73  73  76
  85  84  76  78  75  85  84  87  86  88  85  84  84  84  82  81
  70  83  65  60  60  60  61  60  66  73  60  60  60  60  60  71
  60  61  60  60  71  76  82  61  60  60  60  60  60  60  60  60
  60  70  82  60  64  74  65  63  71  71  72  60  60  60  62  60
  65  60  60  60  63  60  60  71  70  69  63  76  65  60  60  70
  62  64  62  60  70  60  60  61  60  66  62  60  64  60  68  68
  60  61  72  70  66  61  64  77  61  69  66  69  75  83  76  61
  60  60  80  78  65  64  67  74  65  61  70  70  72  70  70  73
  74  78  63  71  67  67  92  94  97  95  80  63  62  72  63  75
  79  71  61  60  68  69  64  71  79  81  74  77  74  63  74  77
  66  62  73  79  84  84  83  75  66  69  61  67  62  62  60  64
  60  66  76  68  80  88  88  89  93  92  89  89  91  88  91  91
  95  93  89  88  76  64  60  60  67  64  60  60  60  60  60  60
  60  60  60  60  60  60  60  69  81  73  66  78  61  60  73  75
%EOF
```

(34)

```
ENTER LOG DATE (DD/MM/YR) : 26/07/79
ENTER SITE CODE (5 CHARS) : 40954
ENTER USER CODE (4 CHARS) : 7327
 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :26 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                  SITE CODE : 40954
SERIAL NUMBER : 1221                       JOB CODE : 240
     BASELINE : 60 DB                      USER CODE : 7327
DYNAMIC RANGE : 64 DB                      THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 2:11

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

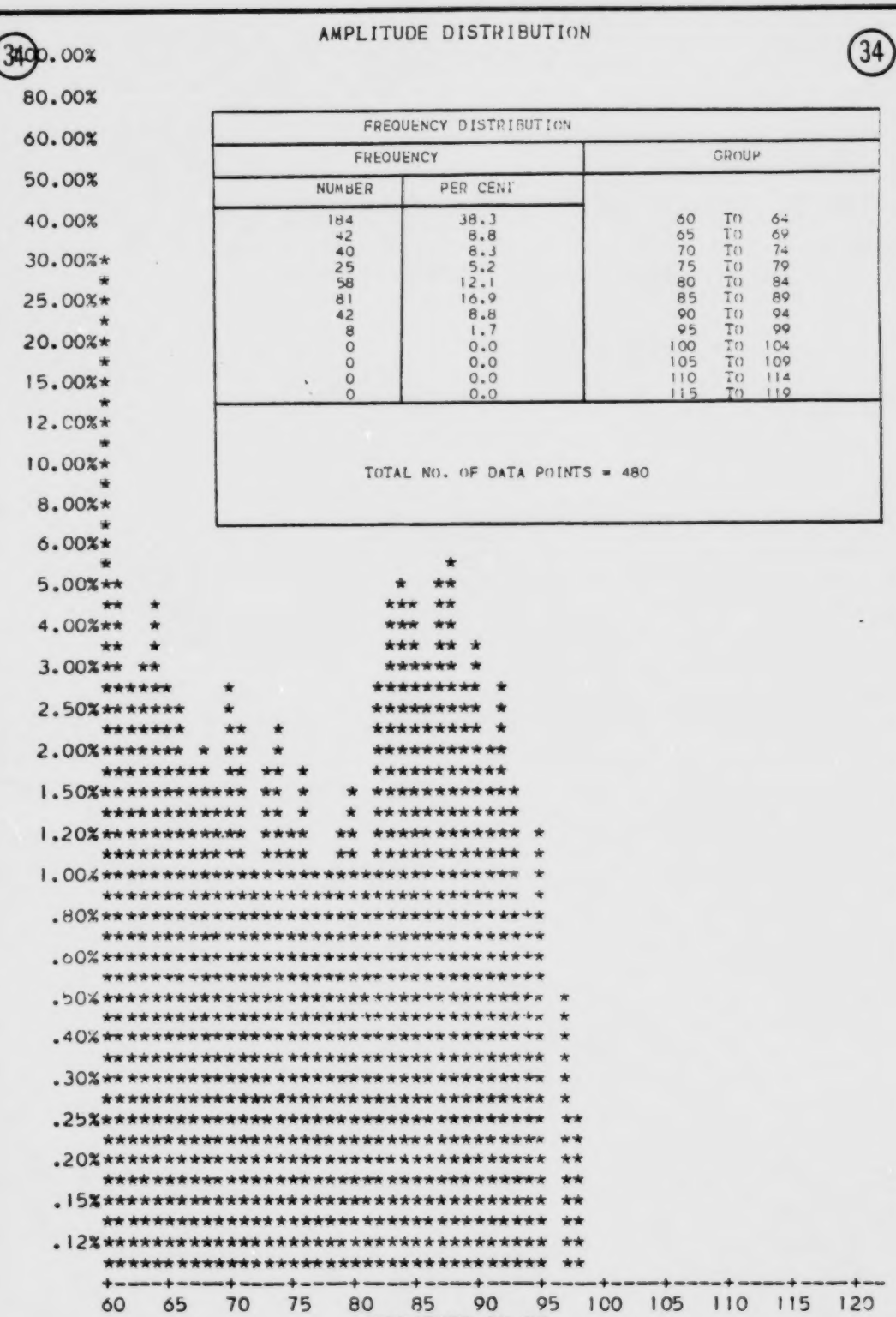
TIME          LOSHA                    %DOSE
HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1       82.9        82.9         4.699        4.70
   2       88.6        86.3        10.314       15.01
   3       87.3        86.7         8.598       23.61
   4       61.0        84.7          .225       23.84
   5       76.2        83.6         1.841       25.68
   6       67.0        82.4          .517       26.19
   7       78.8        82.0         2.659       28.85
   8       62.0        82.0         4.125       32.98
MIN. COMP. =  60 DB                MAX. COMP. =  98 DB
ARITHMETIC MEAN =  73 DB
STD. DEVIATION =  12 DB
VARIANCE =144 DB
```

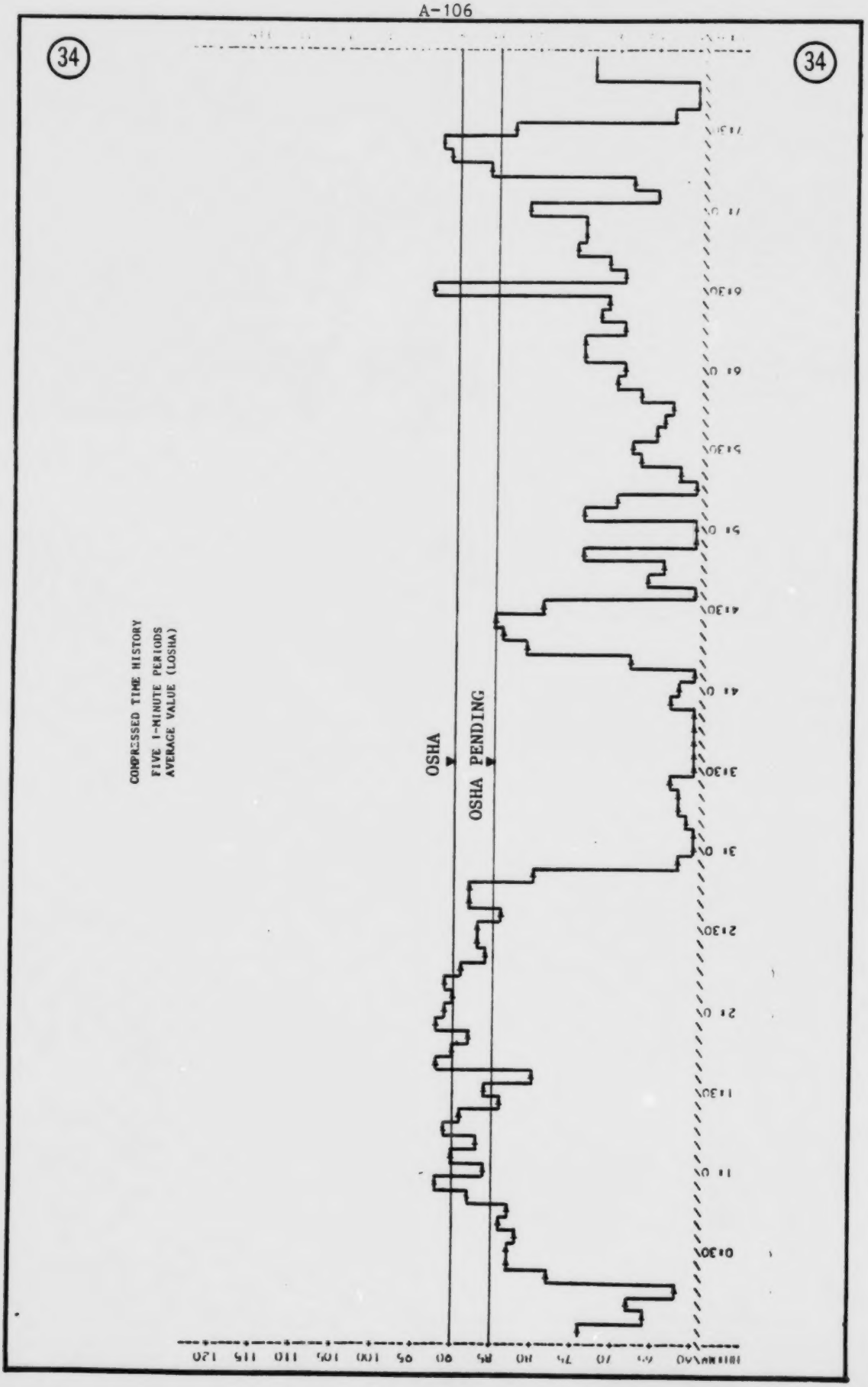
AMPLITUDE DISTRIBUTION

(34) (34)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
184	38.3	60 TO 64
42	8.8	65 TO 69
40	8.3	70 TO 74
25	5.2	75 TO 79
58	12.1	80 TO 84
81	16.9	85 TO 89
42	8.8	90 TO 94
8	1.7	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




34
34
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
INSTRUMENT
65
70
75
80
85
90
95
100
105
110
115
120

(35)

PLACE CARD IN READER WITH 'FOR A' 'SPACE' AND A 'RETURN'
1 20 80 1225 60 64 4 1
20 115200 480
70 65 64 66 64 63 62 62 64 67 63 62 64 60 60 60
60 60 60 67 68 75 74 62 70 62 71 69 60 60 63 68
70 61 67 63 65 71 77 73 74 76 74 73 78 74 66 62
61 64 60 60 62 60 69 63 60 62 60 60 60 61 70 69
73 75 71 79 85 70 60 74 77 84 60 62 62 74 66 87
90 88 95 86 89 92 86 91 88 88 87 86 90 91 91 94
91 90 90 89 86 86 [illegible] 87 92 87 87 90 91 [illegible]
86 89 87 86 87 86 89 93 95 93 91 94 92 92 93 [illegible]
94 96 96 96 94 94 90 95 95 95 97 97 91 92 87 [illegible]
90 95 89 84 92 94 92 94 91 88 92 79 69 60 60 60
60 60 60 60 60 60 66 60 67 67 65 61 60 60 77 [illegible]
73 77 83 84 69 71 71 70 73 80 78 68 69 60 63 61
61 61 61 60 60 60 63 60 78 81 81 83 64 60 61 60
63 62 68 76 77 62 64 90 95 91 73 71 69 63 61 68
61 63 60 72 73 81 67 60 66 60 64 75 73 63 73 73
68 67 69 69 65 61 67 77 73 66 61 61 68 70 77 66
64 63 60 61 60 61 63 66 65 64 76 71 75 61 67 67
60 65 62 66 63 65 64 72 69 84 73 72 68 73 73 66
74 73 70 62 60 60 60 60 66 66 64 69 69 70 61 65
69 60 75 80 73 80 79 69 72 60 69 63 60 63 70 77
75 60 72 60 70 68 61 63 61 73 77 77 78 79 70 80
80 79 73 79 81 78 81 74 74 81 84 83 83 82 83 83
79 78 72 81 64 86 84 75 77 81 83 79 81 83 82 79
75 78 78 75 81 77 84 74 70 73 79 75 77 78 72 68
72 64 84 73 97 92 64 96 88 70 65 61 99 90 83 96
73 71 99 93 87 103 70 96 95 79 65 73 77 77 73 74
78 69 60 78 67 68 77 72 72 72 70 70 71 67 71 67
65 69 63 63 68 70 61 63 60 60 67 76 65 77 67 63
60 60 64 60 60 60 60 60 60 70 69 61 60 60 60 60
60 71 66 60 60 60 60 60 60 60 60 60 60 60 80 63
%EOF

ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 20951
ENTER USER CODE (4 CHARS) : 4820

ENTER JOB CODE (3 CHARS) : 240

DATA LOGGED : 12 SEPT 1979
LOGGER : DR-301/26
SERIAL NUMBER : 1225
[illegible] : [illegible]
[illegible] : [illegible]
[illegible] : [illegible]
[illegible] = [illegible]

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 20951
JOB CODE : 240
USER CODE : 4820
[illegible] :
[illegible] =
START TIME =

[illegible] HISTORY ANALYSIS

[illegible] CORRELATION INDEX (r, .1) CALCULATION
[illegible]
[illegible] = [illegible] / [illegible]
[illegible]
[illegible] = [illegible]
[illegible] DATA POINTS = 480
PERIOD = 1 MINUTES

[illegible]	LOG A [illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	82.1	[illegible]	[illegible]
2	[illegible]	82.3	8.020	8.59
3	[illegible]	85.6	11.703	20.35
4	[illegible]	84.1	[illegible]	[illegible]
5	[illegible]	[illegible]	.641	[illegible]
6	[illegible]	82.1	2.034	24.91
7	[illegible]	82.9	7.791	32.71
8	[illegible]	84.1	[illegible]	[illegible]

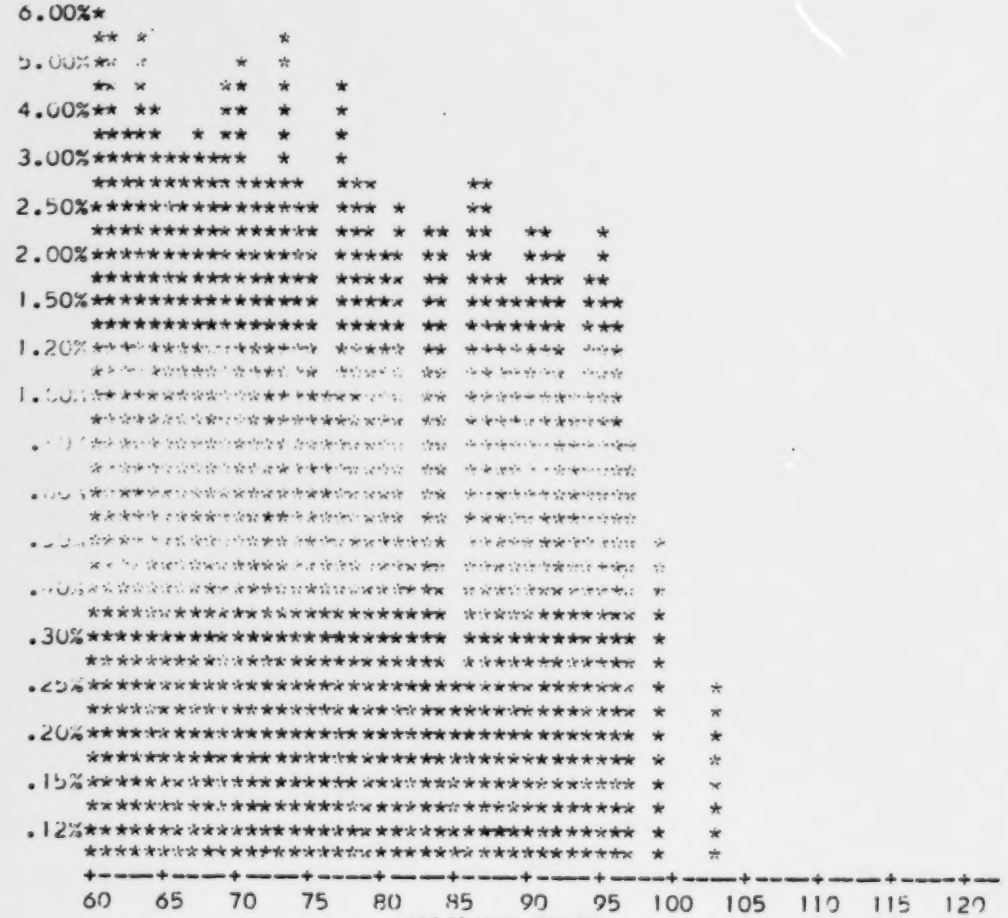
[illegible] COEFF. = [illegible] MAX. COEFF. = [illegible]
ARITHMETIC MEAN = 72.08
[illegible] DEVIATION = 11.08
VARIANCE = [illegible]

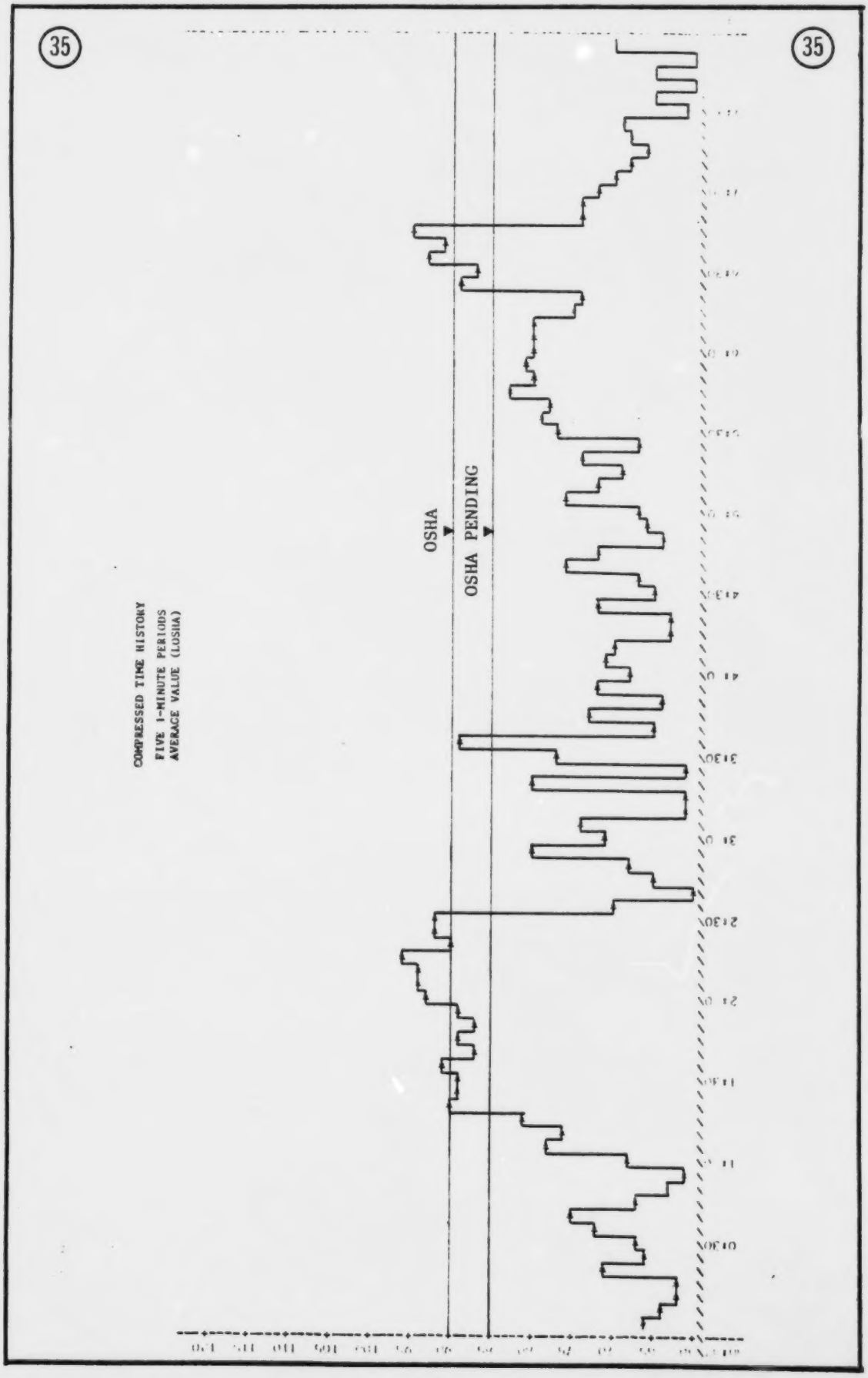
(35)

(35) AMPLITUDE DISTRIBUTION (35)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
145	31.0	60 TO 64
65	13.9	65 TO 69
74	15.8	70 TO 74
51	10.9	75 TO 79
38	8.1	80 TO 84
36	7.7	85 TO 89
37	7.9	90 TO 94
20	4.3	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 460




35
35
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(36)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
1 26 80 1215 60 64 4 1
362 115200 480

60	60	60	60	61	60	60	60	60	60	64	63	70	75	72	62
70	66	72	62	60	60	63	69	69	61	66	60	66	70	76	72
73	78	71	78	76	79	72	74	75	77	74	70	71	72	67	70
71	73	73	69	69	77	76	75	67	70	72	73	69	61	72	66
72	67	70	76	79	79	83	82	82	82	87	89	87	87	89	86
89	90	92	94	97	98	96	92	97	97	97	98	97	96	97	97
89	90	96	92	89	96	96	96	96	96	97	98	99	98	94	95
94	96	95	95	93	94	96	96	96	91	97	97	94	93	93	96
95	97	96	95	94	92	78	93	92	95	98	98	96	96	93	96
91	91	96	89	80	80	89	66	71	82	83	83	80	80	80	83
80	81	85	80	81	82	80	80	80	80	80	80	80	80	82	80
80	84	88	83	74	80	89	78	83	75	79	80	80	80	81	80
82	80	86	70	80	72	89	71	80	71	85	85	73	72	89	87
79	78	81	80	72	72	70	85	89	88	86	74	71	86	80	82
83	83	84	81	70	84	80	89	80	89	70	81	77	83	80	83
80	86	80	87	86	83	89	71	81	85	80	83	87	80	80	80
80	80	80	80	80	82	84	80	81	81	84	81	80	80	80	80
70	80	80	80	80	84	80	80	80	81	81	80	80	81	80	84
80	80	80	80	80	87	85	80	81	83	81	83	83	82	82	80
87	70	86	85	84	80	84	72	82	72	81	76	83	86	78	95
86	90	91	86	74	72	86	70	72	87	88	71	80	72	75	76
80	79	80	81	80	85	87	88	83	80	80	80	80	80	80	80
76	72	83	80	80	80	80	80	80	80	89	72	85	80	81	79	70
80	80	80	80	80	80	80	80	73	76	85	82	80	80	78	74
80	80	80	80	80	80	80	70	89	86	87	70	70	85	75	76
87	80	89	70	75	77	83	83	98	86	78	78	70	75	80	80
80	83	80	80	89	81	83	80	82	88	87	80	81	85	80	84
84	81	87	92	75	80	89	83	71	82	80	86	72	82	73	74
75	75	80	83	91	86	73	78	79	76	78	74	70	70	87	83
88	70	87	88	88	83	72	87	73	88	87	72	83	100	102	93

JEOF

(36)

ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 24950
ENTER USER CODE (4 CHARS) : 4133
ENTER JOB CODE (3 CHARS) : 240

DATA LOGGED : 12 SEPT 1979
LOGGER : DB-301/24
SERIAL NUMBER : 1215
SAMPLING : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 24 HRS 0 MIN

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 24950
JOB CODE : 240
USER CODE : 4133
TAPE SERIAL : 1215
TOTAL SAMPLES = 115200
STARTED AT = 23 HRS 36 MIN

TIME HISTORY ANALYSIS

ARTICULATION INDEX (A.I.) CALCULATIONS
SELECTED OCTAVE BANDS:
LOWER CUT = 75 HZ (-18 DB/OCT)
UPPER CUT (SPEECH) = 9600 HZ
UPPER CUT (SPEECH + NOISE) = 9600 HZ
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

BAND	LOWER CUT OFF FREQ	CUMULATIVE	SPEECH SPECTRUM	CUMULATIVE
1	70.7	70.7	.304	.30
2	89.5	85.0	11.709	12.57
3	88.6	86.4	10.344	22.94
4	88.0	86.8	.781	23.72
5	83.8	83.1	.329	24.05
6	75.7	67.3	1.721	25.67
7	74.0	61.5	1.369	27.04
8	71.7	61.5	1.937	28.98

MIN. COMP. = 60 DB
AUTOMATIC MEAN = 70 DB
STD. DEVIATION = 11 DB
VARIANCE = 121 DB
MAX. COMP. = 102 DB

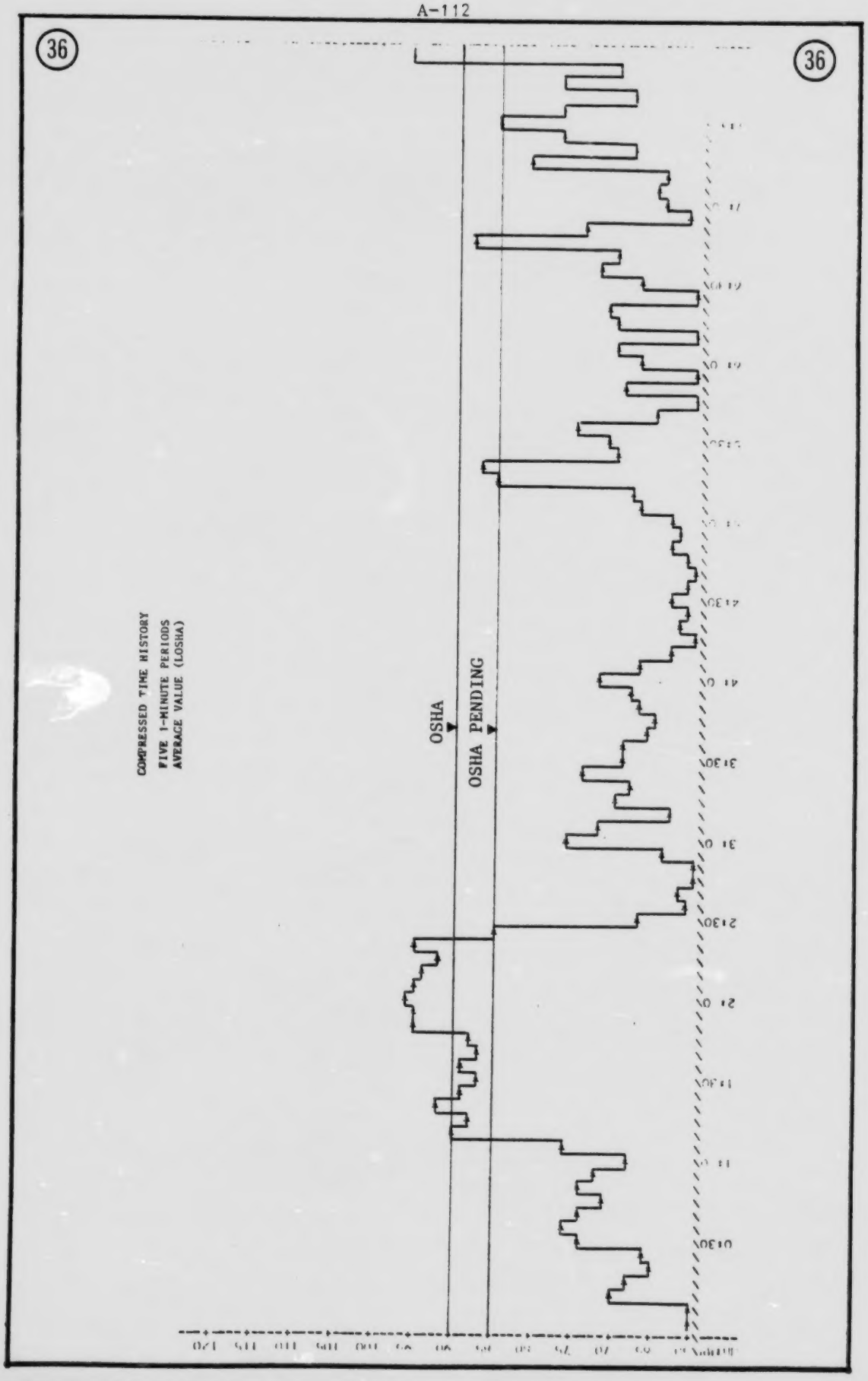
36

AMPLITUDE DISTRIBUTION

36

FREQUENCY DISTRIBUTION		
FREQUENCY		AMPLITUDE
NUMBER	PER CENT	
142	40.0	60 TO 65
53	15.2	65 TO 70
53	15.2	70 TO 75
34	9.2	75 TO 80
10	2.1	80 TO 85
34	7.1	85 TO 90
30	6.3	90 TO 95
22	4.6	95 TO 100
2	.4	100 TO 105
0	0.0	105 TO 110
0	0.0	110 TO 115
0	0.0	115 TO 120

TOTAL NO. OF DATA POINTS = 480


36
36
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
21:30
31:30
41:30
120

(37)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

1 26 80 1212 60 64 4 1

2960 115200 480

62	61	60	60	60	60	62	60	60	60	61	60	60	62	60	60
69	68	74	78	65	74	62	74	71	61	60	62	71	70	66	66
65	63	69	78	71	77	78	79	75	76	73	76	76	75	71	71
66	74	73	73	71	68	72	68	61	73	69	78	77	73	68	74
70	69	74	73	66	69	74	63	68	73	75	84	86	86	80	87
72	68	84	88	92	93	90	88	88	88	87	88	94	88	87	88
[illegible]															
88	88	85	87	94	95	95	95	94	94	92	93	98	97	96	97
96	95	94	89	95	95	97	97	97	93	93	90	93	93	94	91
84	93	98	94	94	93	88	88	87	82	80	72	67	80	69	90
[illegible]															
80	80	80	84	80	80	80	80	84	80	74	80	75	88	82	81
76	80	80	85	80	80	80	80	83	80	80	81	80	80	80	80
80	80	83	80	83	89	80	82	80	80	80	80	81	80	80	80
80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	84
80	80	84	80	80	80	80	80	86	80	80	80	80	80	80	80
80	80	80	80	80	80	80	80	80	80	80	81	80	80	80	80
80	80	80	80	80	80	80	80	80	80	80	82	80	80	80	80
80	80	80	80	80	80	80	80	80	80	80	80	85	80	80	80
80	80	81	80	80	80	88	83	80	80	80	84	70	73	87	83
88	80	71	70	84	93	80	89	82	70	75	82	78	89	81	82
88	80	80	83	87	81	82	79	80	81	81	72	80	74	81	80
80	80	80	80	80	70	80	84	83	80	80	80	80	80	80	78
76	83	80	71	81	82	80	80	80	80	80	80	80	80	80	75
85	83	81	85	82	88	80	80	80	80	81	80	81	74	76	86
84	80	81	80	82	79	87	88	82	80	76	80	80	80	80	75
81	81	72	80	83	80	80	83	80	80	80	80	80	80	80	82
83	80	80	81	80	80	80	80	74	72	71	80	80	87	80	83
89	88	85	80	82	75	73	81	89	84	70	86	80	75	80	86
89	73	73	75	88	76	71	88	92	100	100	87	99	101	100	100

%EOF

ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 24950

ENTER USER CODE (4 CHARS) : 4241
ENTER JOB CODE (3 CHARS) : 240

DATA LOGGED :12 SEPT 1979
LOGGER : 08-301/26
SERIAL NUMBER : 1212
BASELINE : 60.00
GRAPHIC RANGE : 64.00
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 2.0

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 24950
JOB CODE : 240
USER CODE : 4241
THRESHOLD : 80.00
TOTAL SAMPLES = 11520
STARTED AT = 12:..

TIME HISTORY ANALYSIS

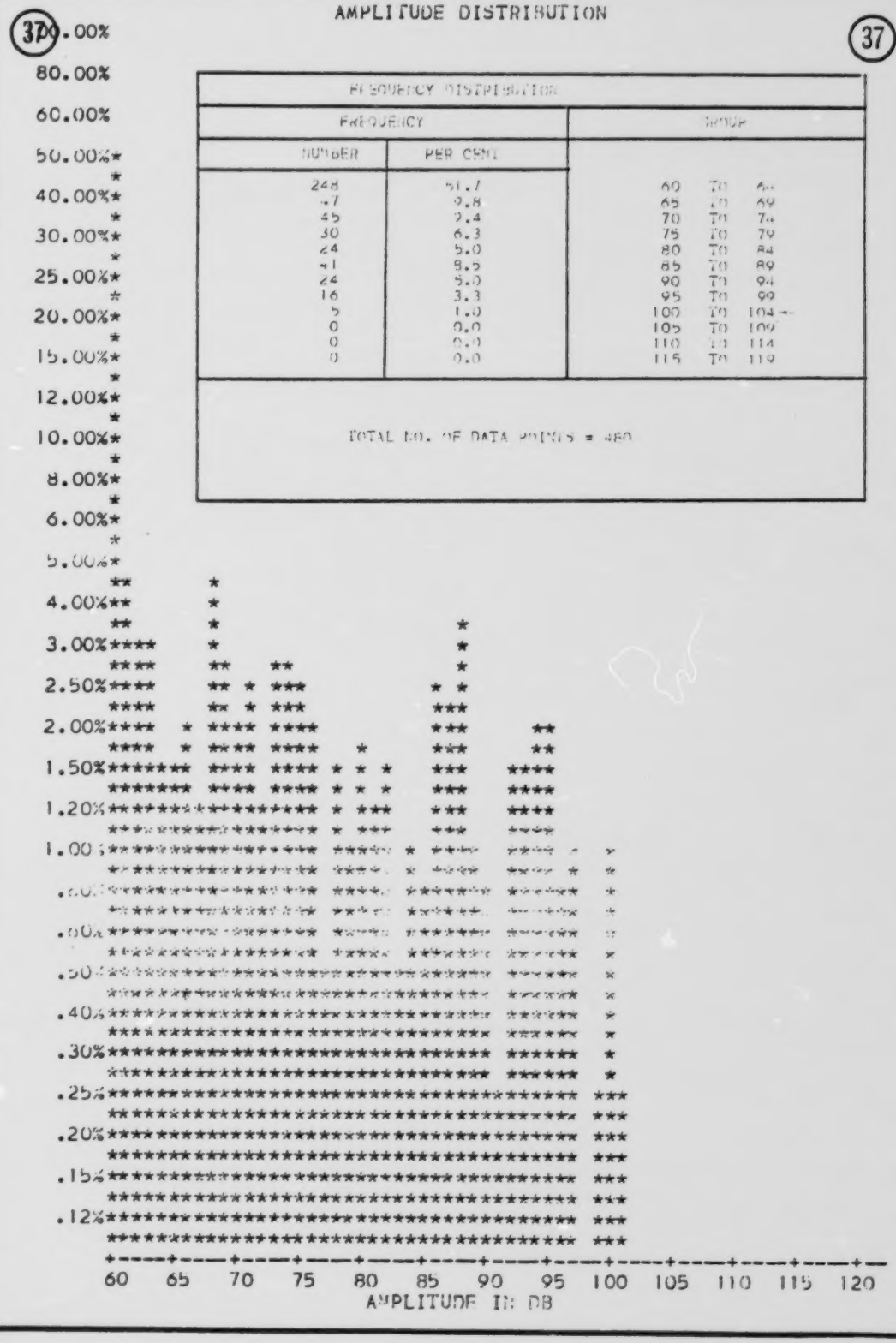
DATA BASED ON LOGA (Ver.1.) CALCULATIONS
ARE ADJUSTED TO THE FOLLOWING:
TEST DUR = [illegible]
STARTED (SAMPLES) AT =
THRESHOLD (CUTOFF) LEVEL = 80.00
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	DATA		TEST	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	70.6	70.6	.848	.85
2	76.7	73.4	7.217	8.11
3	[illegible]	80.0	11.[illegible]	20.42
4	81.2	84.6	.648	21.09
5	81.0	82.1	.224	20.92
6	74.1	81.3	1.384	22.30
7	70.4	82.4	.283	23.12
8	82.4	81.3	6.039	24.52

MIN. COMP. = 60.00 MAX. COMP. = 101.00
ARITHMETIC MEAN = 76.08
STD. DEVIATION = 12.06
VARIANCE =144.78

AMPLITUDE DISTRIBUTION

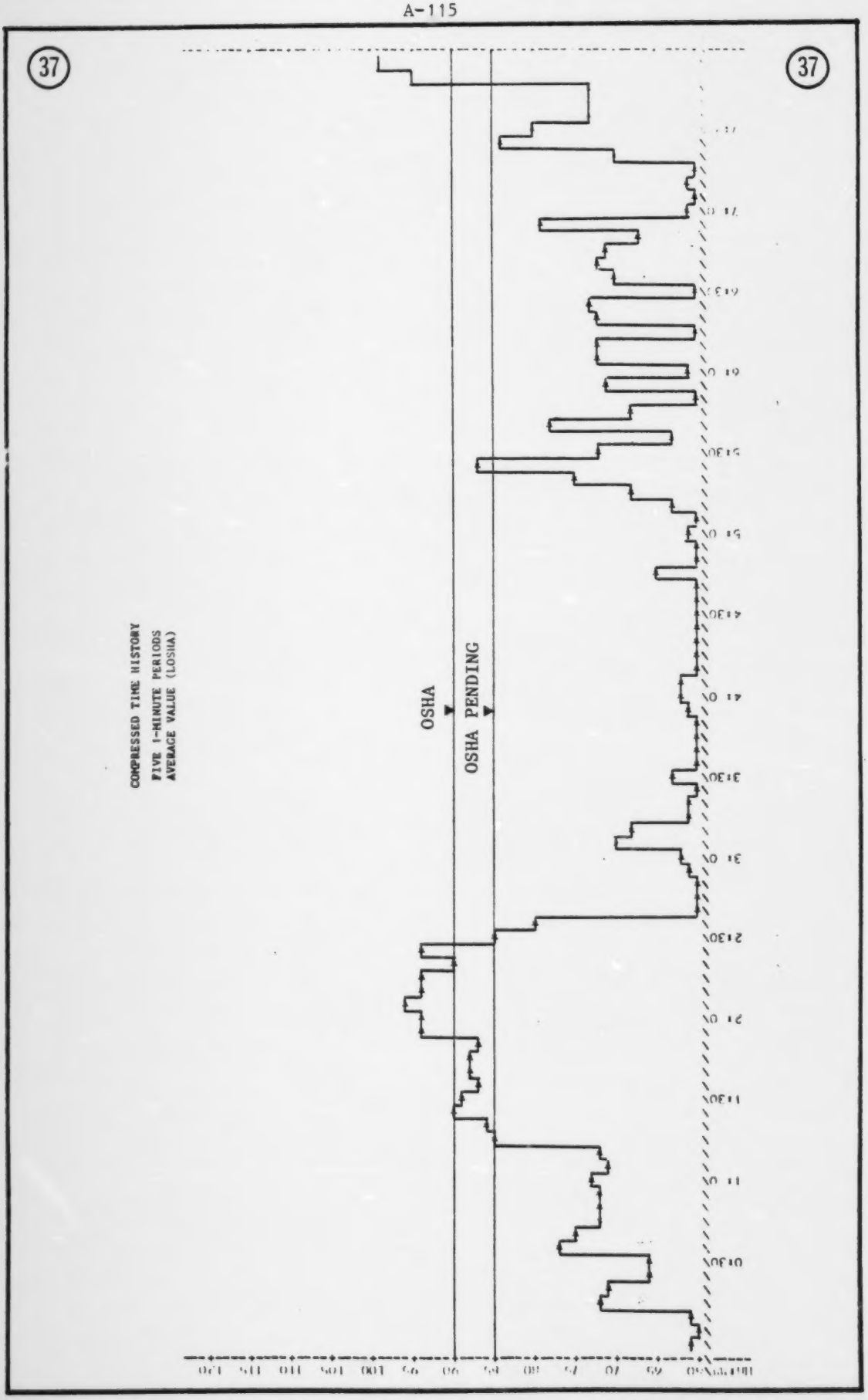
37



FREQUENCY DISTRIBUTION

FREQUENCY		MODE
NUMBER	PER CENT	
248	51.7	60 TO 64
47	9.8	65 TO 69
45	9.4	70 TO 74
30	6.3	75 TO 79
24	5.0	80 TO 84
41	8.5	85 TO 89
24	5.0	90 TO 94
16	3.3	95 TO 99
5	1.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


37
37
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00

(38)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1213    60    64     4     1
      48      115200   480
  60  66  75  61  61  60  64  60  61  72  74  78  80  62  76  67
  77  75  63  60  68  73  75  66  72  67  65  76  81  75  79  80
  80  77  77  81  75  74  67  76  81  75  65  61  67  83  72  73
  70  61  80  62  69  72  70  74  64  76  60  64  74  65  67  65
  68  63  80  82  78  82  78  80  89  76  79  86  89  94  92  91
  91  93  93  99  94  98  96  94  98  99  99  97  98  93  90  95
  97  99  96  98  98  97  93  68  61  64  90  65  61  60  60  60
  61  70  69  65  62  60  61  60  60  62  64  60  68  60  60  63
  64  60  60  60  73  64  63  64  77  60  77  62  60  77  82  83
  89  83  93  91  76  74  61  81  77  98  82  82  95  84  92  97
  95 100  93  97  79  64  60  60  60  60  60  72  60  70  87  94
  90  84  84  84  82  98  96 103 101 106  99 100  85  91  96 101
  98 101 100 100  98  96  92 101 104 101  97 104 102 100  97  79
  78  81  91  94 102 100  99 101  98 100 100  91  82  83  97  96
  96 104  98 100 104 105 105 103  99  97 100  86 103  82 100 106
 105 102  98  97 100  95  78  62  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  62  60  64  60  60  61  86  63  60  60
  60  61  60  60  60  60  60  72  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  65  62  60  89
  90  85  77  77  82  80  82  83  83  84  85  91  75  86 101  86
  80  82  95  90 109  97  95  86  91  85  85  93  78  74  82  83
  84  85  84  84  83  85  85  85  86  84  85 101  97  93  95  98
  98  86  85  82  82  83  92 101  99  98 103 104  81  81  82  84
  85  99  96  85  85  82  83  83  83  83  84  88  99  95  99  97
  81  84  85  81  87  97  99  94  83 100  93  85 101 103  93  86
 102  96  86  86 101  99  95  87 104 105 105 101 106  99 100  98
  87  87  84  67  75  85  85  86  86  80  60  60  60  78  63  79
  77  84  84  73  79  82  80  82  76  77  81  81  80  80  80  80
  80  80  81  81  81  81  81  81  81  80  79  81  80  81  80  81
  81  80  80  80  80  79  76  65  60  60  60  60  60  60  60  60
%EOF
```

(38)

```
ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 26965

ENTER USER CODE (4 CHARS) : 2748
 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :12 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
       LOGGER : DB-301/26                  SITE CODE : 26965
SERIAL NUMBER : 1213                       JOB CODE : 240
      BASELINE : 50 DB                     USER CODE : 2748
DYNAMIC RANGE : 94 DB                     THRESHOLD :  60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8 H 0 M 0 S          STANDBY TIME =   0 H 0 M
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HR
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	73.6	73.6	1.282	1.28
2	91.4	87.0	15.203	16.49
3	84.5	86.3	5.828	22.31
4	99.2	92.1	44.967	67.28
5	84.1	91.1	5.547	72.83
6	91.1	91.1	14.545	87.37
7	96.1	92.1	29.270	116.64
8	79.1	91.3	2.768	119.41

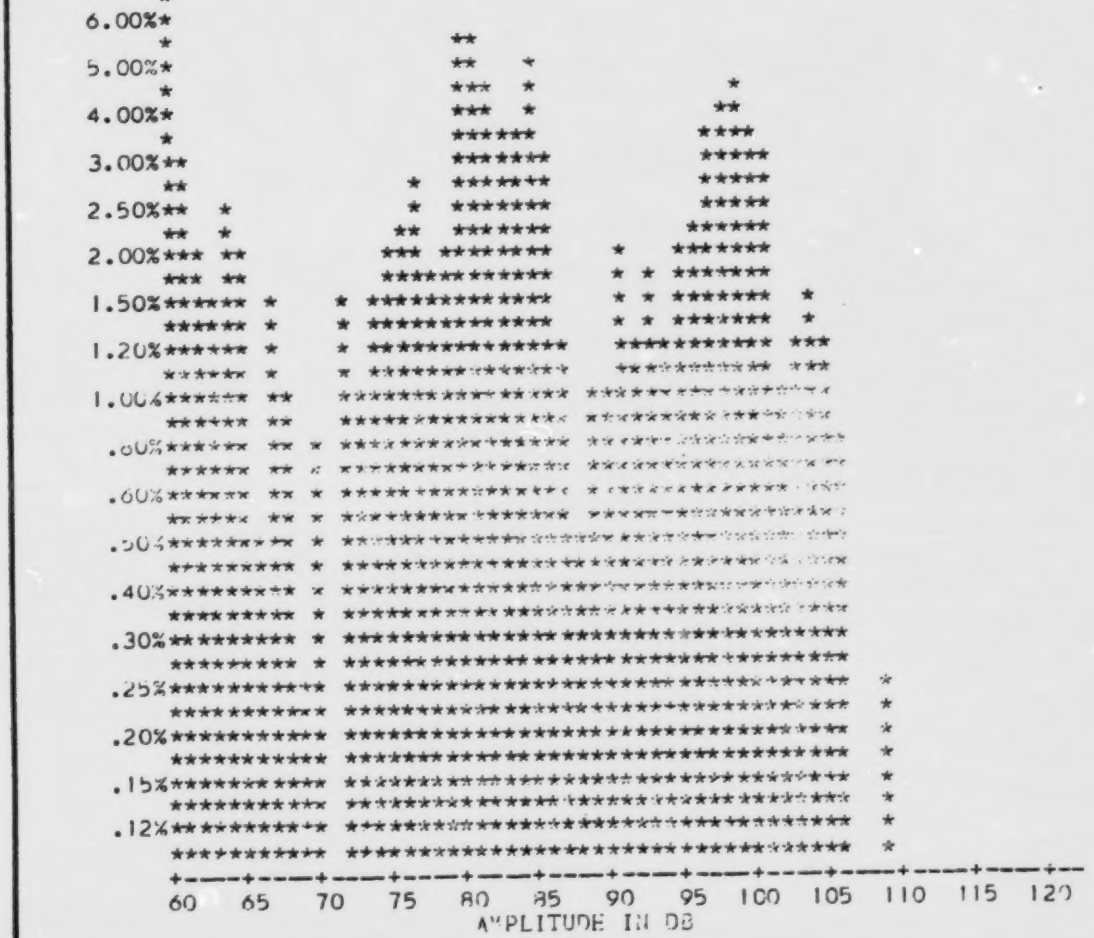
MIN. COMP. = 60 DB MAX. COMP. = 109 DB
ARITHMETIC MEAN = 90 DB
STD. DEVIATION = 14 DB
VARIANCE =196 DB

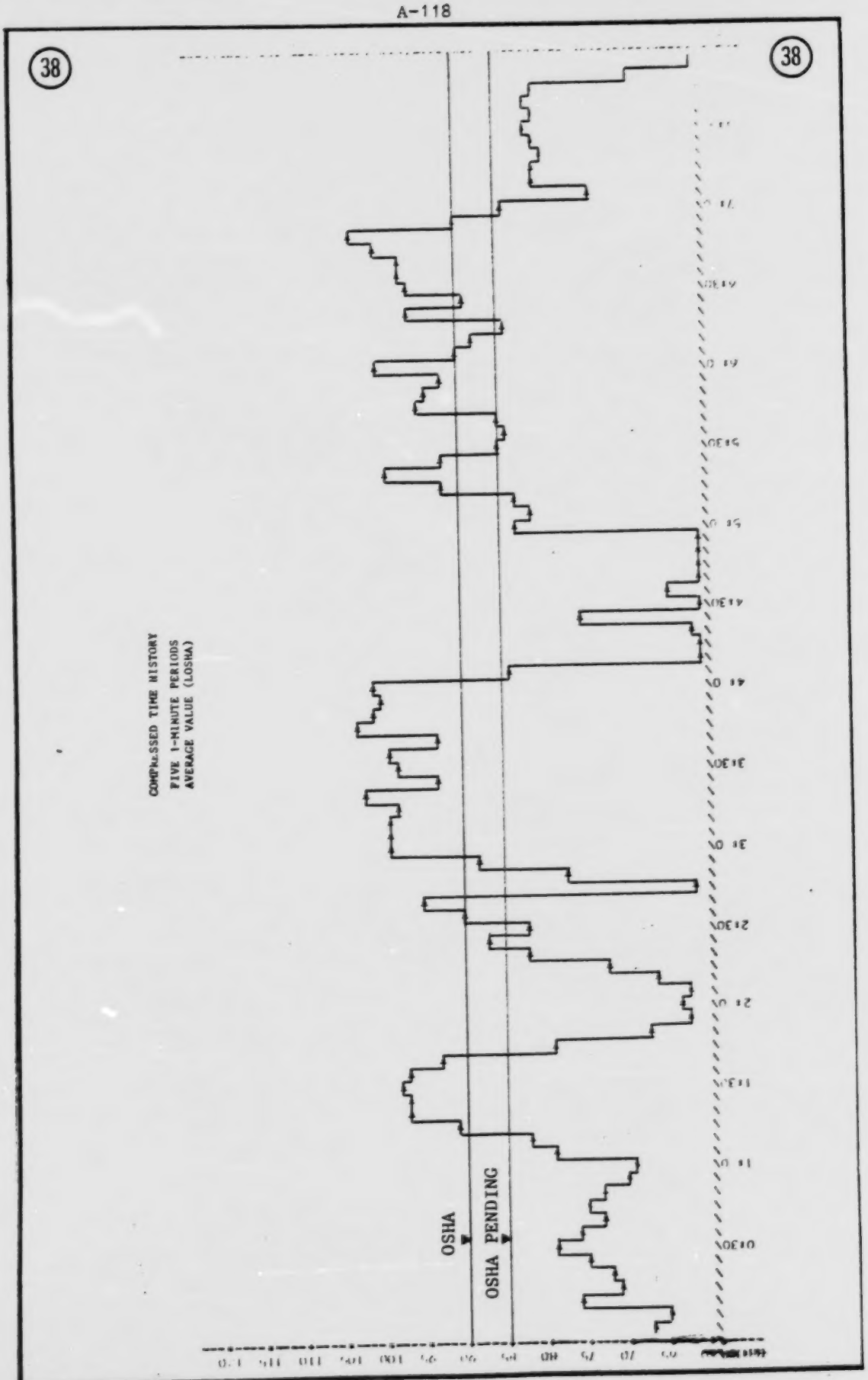
AMPLITUDE DISTRIBUTION

(38) (38)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
119	24.8	60 TO 64
21	4.4	65 TO 69
19	4.0	70 TO 74
43	9.0	75 TO 79
92	19.2	80 TO 84
43	9.0	85 TO 89
29	6.0	90 TO 94
64	13.3	95 TO 99
41	8.5	100 TO 104
9	1.9	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




38
38
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(39)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(39)

```
  1  26  80  1224    60    64     4     1
     51      115200  480
 60  60  60  60  60  60  60  60  60  60  60  62  61  69  73  62
 62  64  63  66  60  60  60  62  63  64  60  69  60  63  66  71
 66  66  75  66  70  72  77  72  68  72  78  75  65  62  62  60
 61  61  60  61  69  67  67  75  60  62  71  65  69  60  62  71
 75  75  68  61  67  71  77  76  70  68  74  67  77  61  64  70
 90  75  62  94  86  65  67  90  92  66  65  67  65  65  69  67
 87  85  80  86  91  88  86  85  86  80  87  85  85  85  80  85
 91  91  94  91  93  90  91  92  93  93  96  97  96  93  92  93
 96  95  96  98  95  93  93  79  95  91  94  85  96  95  96  93
 93  89  87  80  86  71  60  61  60  60  63  69  63  60  60  62
 65  61  60  61  72  60  74  60  60  63  60  60  60  60  64  62
 60  61  62  72  68  77  60  60  79  63  60  76  60  64  74  63
 62  64  60  72  68  67  73  70  60  60  61  63  53  60  60  66
 61  74  74  67  73  71  69  68  73  65  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  66  60  60  75  60  60
 60  60  60  69  60  60  60  61  61  60  60  60  60  61  60  62
 67  60  60  60  60  60  60  63  62  60  60  60  60  60  60  60
 60  60  60  60  60  60  61  60  60  70  60  81  77  63  64  60
 61  67  60  60  60  67  60  77  71  60  60  60  60  60  64  66
 60  66  65  67  60  66  60  63  69  61  79  63  62  61  65  66
 92  86  88  89  82  79  70  60  75  60  60  61  63  65  69  77
 68  77  77  69  60  60  60  67  60  68  60  60  60  67  60  60
 60  73  73  62  60  60  60  60  60  60  60  69  70  60  60  76
 73  60  60  60  60  60  60  60  60  68  78  66  64  60  60  74
 78  60  63  60  60  60  60  60  68  70  72  66  61  60  60  70
 75  72  60  60  60  67  65  60  60  60  60  72  81  72  75  72
 60  60  60  63  60  60  61  60  60  60  60  65  64  60  63  62
 60  60  60  60  70  62  64  60  60  60  61  60  60  60  78  78
 73  61  66  74  81  82  84  90  82  76  79  74  81  72  71  67
 63  63  67  61  61  71  60  62  63  64  60  61  60  60  61  88
JOB
```

```
ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 26965
ENTER USER CODE (4 CHARS) : 7774
 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :12 SEPT 1979
        LOGGER : DR-3017/26
SERIAL NUMBER : 1224
     CHANNEL : 0 DB
 GAIN SETTING : 60 DB
SAMPLING RATE : 9/SEC
TEST DURATION =  53 MINUTES
```

```
DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 26965
    JOB CODE : 240
    USER CODE : 7774
    CHANNEL : 0
TOTAL SAMPLES =  28800
TEST DURATION =  53 MINUTES
```

TIME HISTORY ANALYSIS

```
DOSE EXPOSURE INDEX (D.E.I.) CALCULATION
DOSE LEVEL OF THE CHANNEL:
DOSE = 7.5 RAD
EXPOSURE (DURATION) TIME = 53
EXPOSURE (DURATION) TIME = 3180
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	DOSE			
(MIN)	CUMULATIVE	% OF TOTAL	% OF D.E.I.	CUMULATIVE
1	67.0	67.0	.913	.91
2	86.0	91.5	7.215	7.73
3	94.0	95.4	8.317	16.05
4	96.7	97.9	.597	16.65
5	98.6	99.1	.370	17.02
6	73.6	80.3	1.316	18.34
7	97.2	98.4	.976	19.32
8	82.7	89.9	1.169	20.49

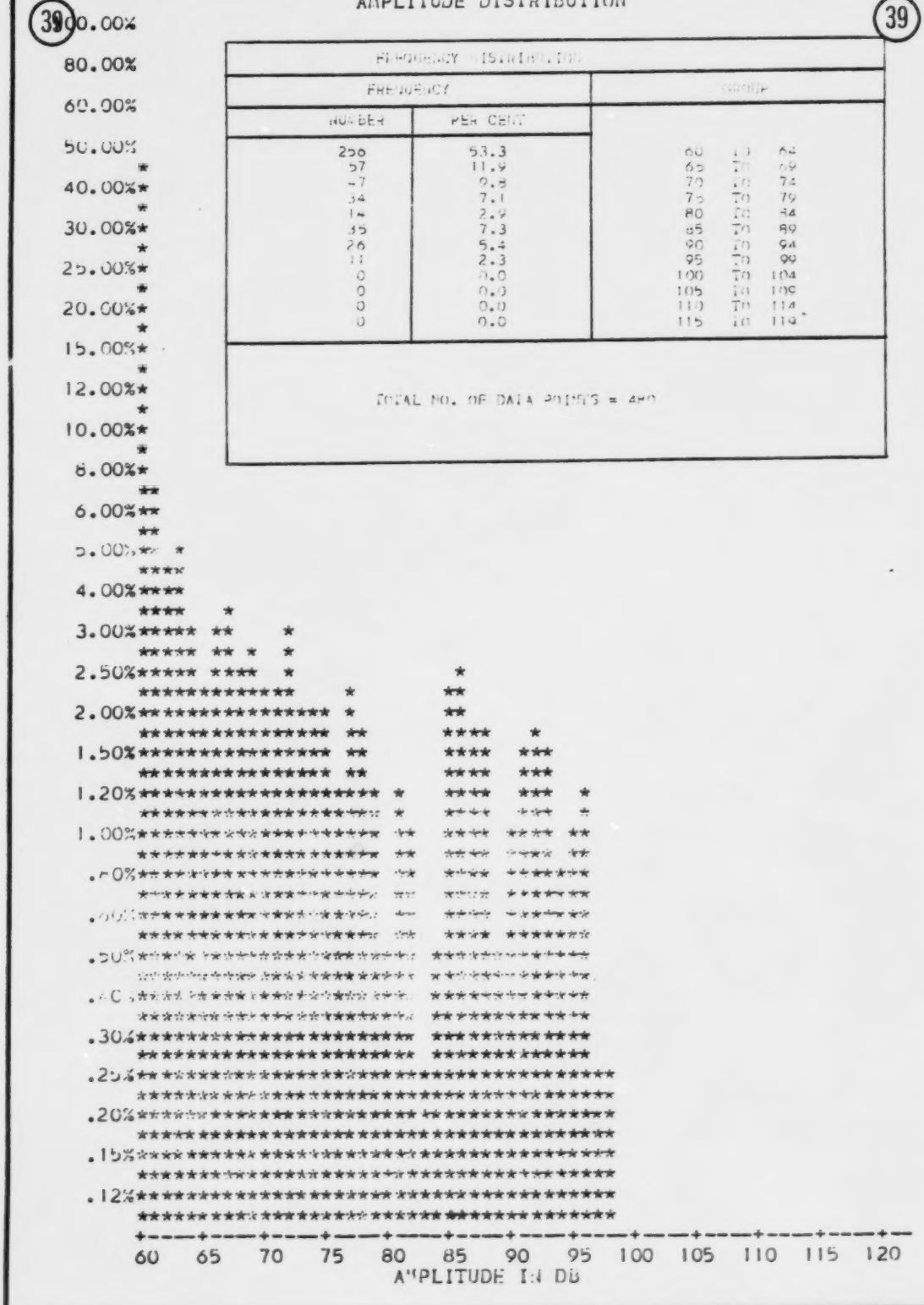
```
MIN. COMP. =  60 DB          MAX. COMP. =  98 DB
ARITHMETIC MEAN =  85 DB
STD. DEVIATION =  11 DB
VARIANCE = 120 DB
```

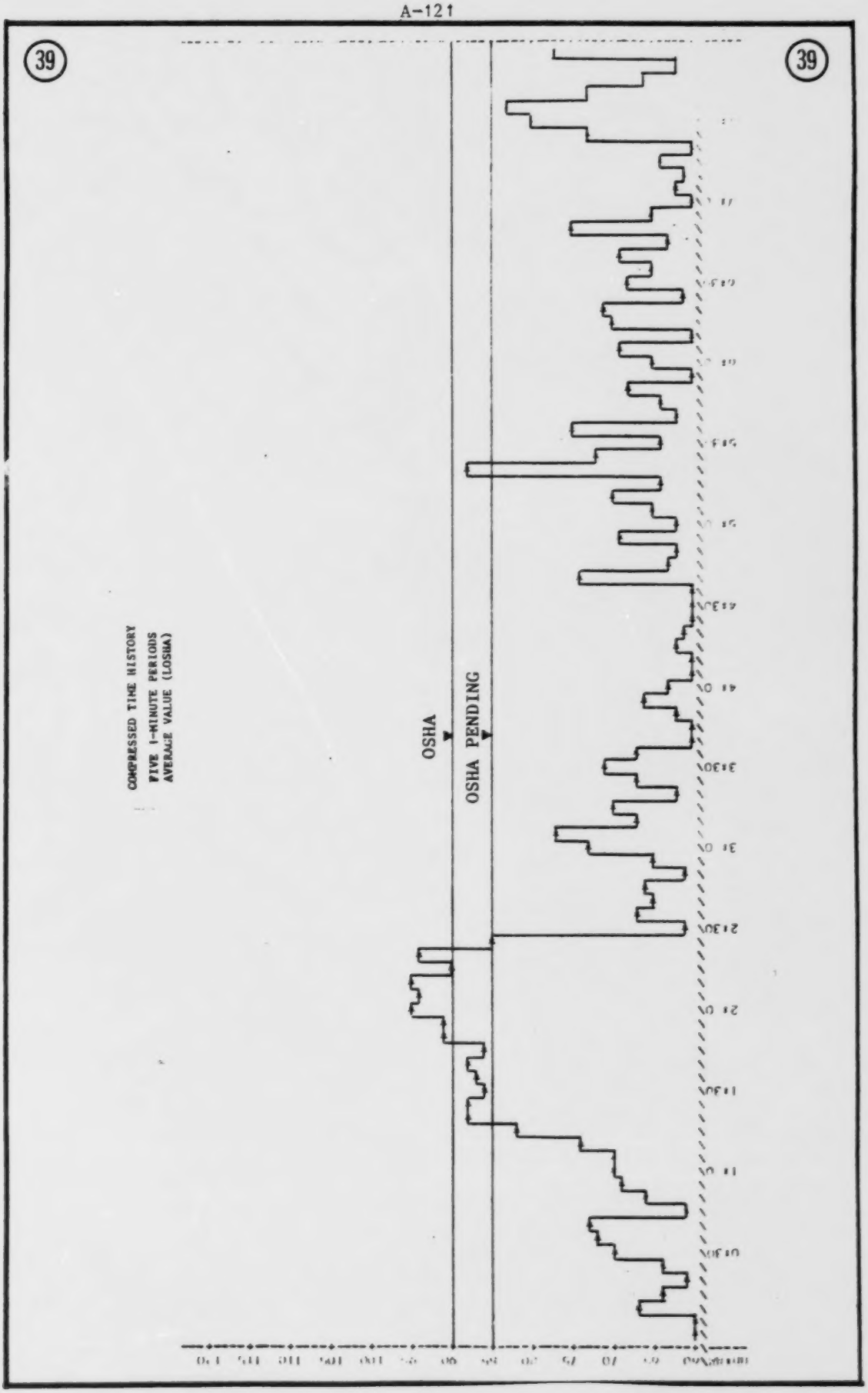
AMPLITUDE DISTRIBUTION

(39) (39)

FREQUENCY DISTRIBUTION		
FREQUENCY		AMPLITUDE
NUMBER	PER CENT	
250	53.3	60 TO 64
57	11.9	65 TO 69
47	9.8	70 TO 74
34	7.1	75 TO 79
14	2.9	80 TO 84
35	7.3	85 TO 89
26	5.4	90 TO 94
11	2.3	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




39
39
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(40)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1216    60    64     4     1
      76      115200   480
  62  64  64  61  60  62  60  63  65  63  61  64  60  60  63  62
  60  68  68  73  80  73  68  74  73  78  66  64  65  71  72  73
  71  72  62  72  77  80  78  77  83  78  64  61  80  77  79  77
  72  71  77  66  73  71  63  76  68  64  67  70  72  75  71  71
  69  70  72  72  67  69  83  78  76  74  77  82  85  85  89  86
  60  72  68  80  84  89  96  83  81  82  82  91  90  94  94  89
  90  89  89  86  85  91  91  91  91  92  90  91  86  88  86  87  88
  90  93  89  91  91  91  96  96  99  93  95  92  93  93  93  95
  97  96  93  96  95  95  98  97  99  99  97  94  93  91  93  92
  95  87  94  95  98  99  96  81  87  77  85  95 101  92  82  80
  79  75  79  78  77  80  80  80  80  80  80  80  80  80  81  80
  80  80  80  80  71  67  61  63  80  61  80  80  80  83  80  81
  80  80  80  61  80  80  80  80  80  80  80  83  83  80  80  80
  80  80  84  83  86  85  83  81  82  81  81  79  80  83  84  85
  78  73  78  82  84  85  84  84  83  82  83  84  85  83  85  85
  81  82  82  83  85  84  83  83  83  80  82  82  81  76  80  80
  80  80  80  80  81  80  80  80  82  80  80  80  84  80  80  80
  80  84  80  80  83  86  88  81  83  80  83  80  83  83  74  80
  80  80  80  80  71  83  83  84  85  85  85  85  84  84  84  84
  84  84  84  84  85  85  81  82  82  84  86  86  85  85  84  83
  83  83  84  84  84  84  87  83  82  83  82  82  84  85  86  85
  85  85  85  84  84  84  84  85  83  82  81  83  90  92  87  78
  80  82  83  80  81  80  80  73  80  80  80  80  80  85  80  80
  80  80  81  85  82  83  86  85  80  83  80  80  80  87  78  81  80
  69  73  82  84  83  83  83  83  84  83  83  82  82  82  83  82
  83  83  83  83  83  83  83  83  83  83  83  83  83  83  83  84
  85  85  85  85  83  82  82  82  79  77  75  78  82  83  83  83
  83  83  84  84  83  82  84  80  82  82  84  83  82  82  82  86
  79  89  78  88  98  92  92  98  96  94  83  77  68  72  76  79
  70  66  71  71  80  91  87  95  98  99  98  95  95  97  95  92
%EOF
```

(40)

```
ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 32990
ENTER USER CODE (4 CHARS) : 2277

 ENTER JOB CODE (3 CHARS) : 240
```

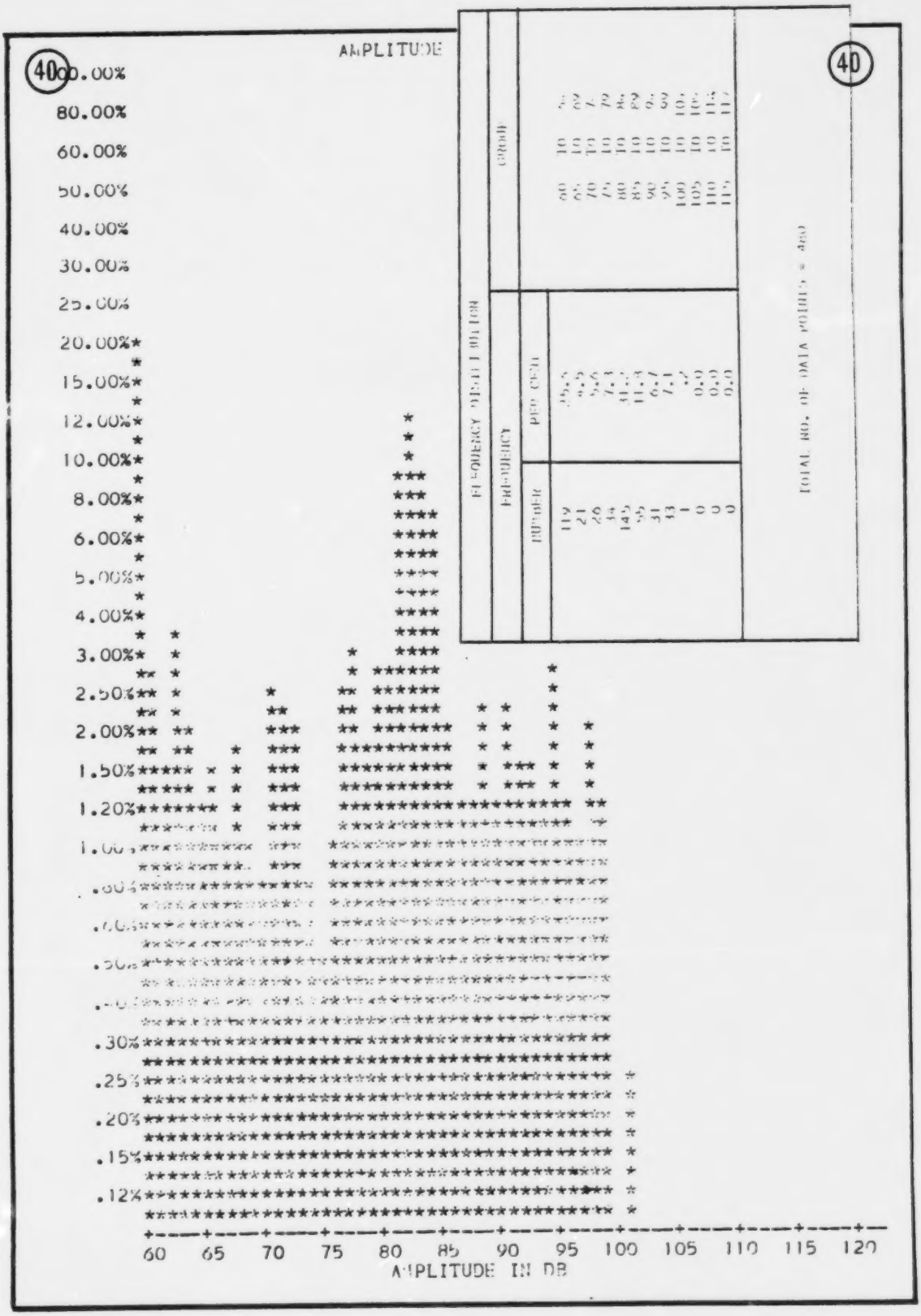
```
   DATA LOGGED :12 SEPT 1979                DATA ANALYZED : 27 SEPT 1979
        LOGGER : DB-301/26 -                     SITE CODE : 32990
 SERIAL NUMBER : 1216                            JOB CODE : 240
     BASELINE : 50 DB                            USER CODE : 2277
 DYNAMIC RANGE : 64 DB                           RESPONSE :
 SAMPLING RATE :  4/SEC                     TOTAL SAMPLES =  115200
 TEST DURATION =   8  (H:M)                   START TIME =   0:  0:10
```

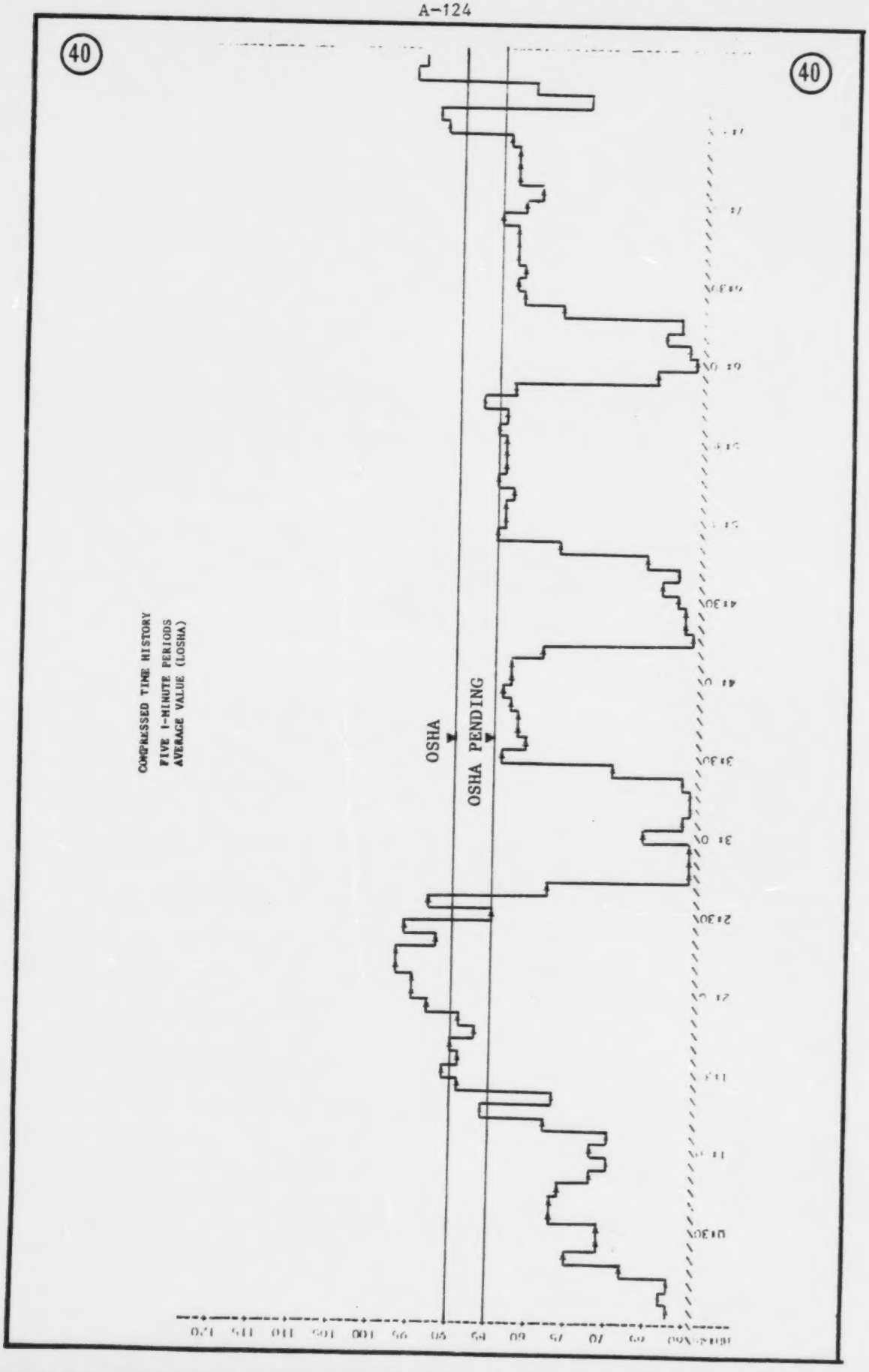
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
MINIMUM DB FOR ACCEPTANCE:
INDEX LOG = 20 LOG / 480
INDEX = (INDEX LOG) - 108 =
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

PERIOD	LOW A CORRECTED	LOW A CUMULATIVE	HIGH A CORRECTED	HIGH A CUMULATIVE
1	42.1	42.1	1.036	1.04
2	87.1	83.0	8.407	9.45
3	91.7	87.1	15.734	25.18
4	88.4	89.7	2.197	27.38
5	79.2	88.6	1.041	28.42
6	83.7	84.5	5.239	34.76
7	79.6	83.9	3.044	37.80
8	88.5	87.7	10.203	48.00

MIN. CORR. = 60 DB MAX. CORR. = 101 DB
ARITHMETIC MEAN = 77 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB


AMPLITUDE
40
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
PER CENT
TOTAL NO. OF DATA POINTS = 460


40
40
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(41)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214    60    64     4     1
     139     115200  480
  66  69  66  62  60  60  64  61  60  62  60  66  60  60  60
  60  63  74  77  62  73  68  73  70  73  72  70  74  73  73  70
  74  77  66  68  67  68  64  64  63  60  63  60  60  60  62  60
  62  75  68  65  71  66  69  63  74  75  67  65  61  61  61  69
  60  62  66  74  71  61  63  60  60  73  76  78  65  64  67  60
  60  70  66  69  75  72  71  65  67  69  64  64  66  66  60  66
  63  61  62  60  67  74  60  61  75  66  71  76  67  67  67  67
  75  61  60  60  90  90  76  87  89  86  86  90  91  67  66  66
  86  85  86  84  82  87  85  87  86  80  74  64  64  67  77  76
  75  60  63  70  73  60  60  60  60  60  75  61  65  61  60  60
  60  60  63  82  89  86  89  89  95  97 100 100  96 101 101 101
  99 101  90  93 100  99  96  99  99 100 100  99  97  96 100  98
  93  98  96 100  97  98  96  99  96  98  99  95  94  96  96  96
  97  96  97  86  90  87  80  72  83  60  61  60  60  64  66  61
  60  63  60  60  70  69  75  67  68  62  66  65  70  64  60  67
  82  78  80  82  71  68  73  67  69  79  83  77  66  65  60  62
  65  78  78  82  69  74  62  77  71  70  79  83  82  82  78  78
  68  76  79  80  79  85  85  91  77  85  82  76  67  72  61  62
  65  71  73  73  75  77  79  69  73  65  79  64  70  76  75  82
  74  80  82  76  81  80  63  82  71  73  81  82  77  82  72  82
  72  75  66  76  75  75  77  79  76  70  71  68  75  63  72  71
  67  73  69  65  69  73  75  85  84  88  90  82  65  60  69  68
  62  60  66  70  61  60  66  60  62  63  61  65  61  66  73  87
  93  87  67  67  66  66  65  65  62  61  63  68  67  71  73  65
  69  61  74  69  81  83  76  75  75  75  77  71  77  77  65  73
  65  60  63  73  73  83  79  81  80  79  72  88  84  87  85  82
  77  60  79  80  73  60  72  72  72  64  60  61  61  64  62  72
  61  60  60  60  72  62  60  60  60  60  60  60  66  75  60  60
  60  60  60  60  60  60  60  62  60  60  64  63  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  61  61  60  60  60
%EOF
```

(41)

```
ENTER LOG DATE (DD/MM/YR) : 13/09/79
ENTER SITE CODE (5 CHARS) : 20951
ENTER USER CODE (4 CHARS) : 4420

 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :13 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
      LOG ID : 03-301/26                 SITE CODE : 20951
SERIAL NO. OF : 1214                      JOB CODE : 240
      ENGELL. : 0.00                      USER CODE : 4420
 DATA ID RATE : 64 BPS                    ID  CODE :
SAMPLING RATE : 4/SEC                  TOTAL SAMPLES =  1214
 SEC. / TITLE =  60.00                 SAMPLES / SEC =  4.00
```

TIME HISTORY ANALYSIS

```
SOLO  ...ATION I.A.S. (...T.) CALCULATIONS
 OF  ...  ... OF COLLATED
...  ... = ... / ...
...  ... (...LIED BY ...) = ...
...  ... ... = ...
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

MIN	...	...	CURRENT	...
1	68.3	68.3	.614	.61
2	70.7	73.6	1.968	2.58
3	...	...	11.709	11. .
4	93.3	87.2	19.336	34.13
5	77.9	80.1	2.331	36.46
6	76.8	80.2	2.002	38.46
7	77.6	83.5	3.246	41.71
8	63.0	53.6	.323	42.03

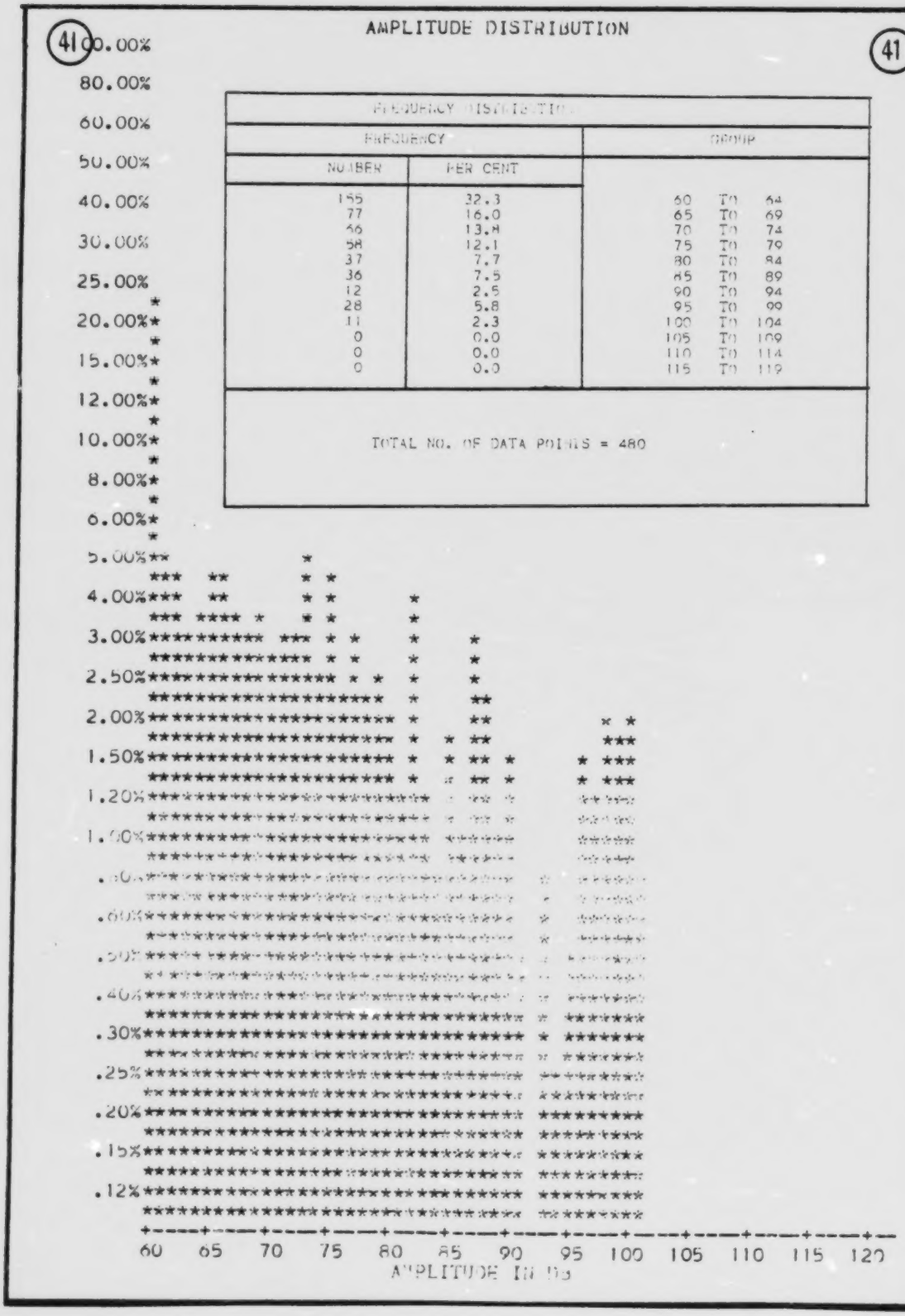
```
MIN. COMP. =  60.00                MAX. COMP. = 101.00
ARITHMETIC MEAN =  72.00
STD. DEVIATION =  12.76
VARIANCE =146.00
```

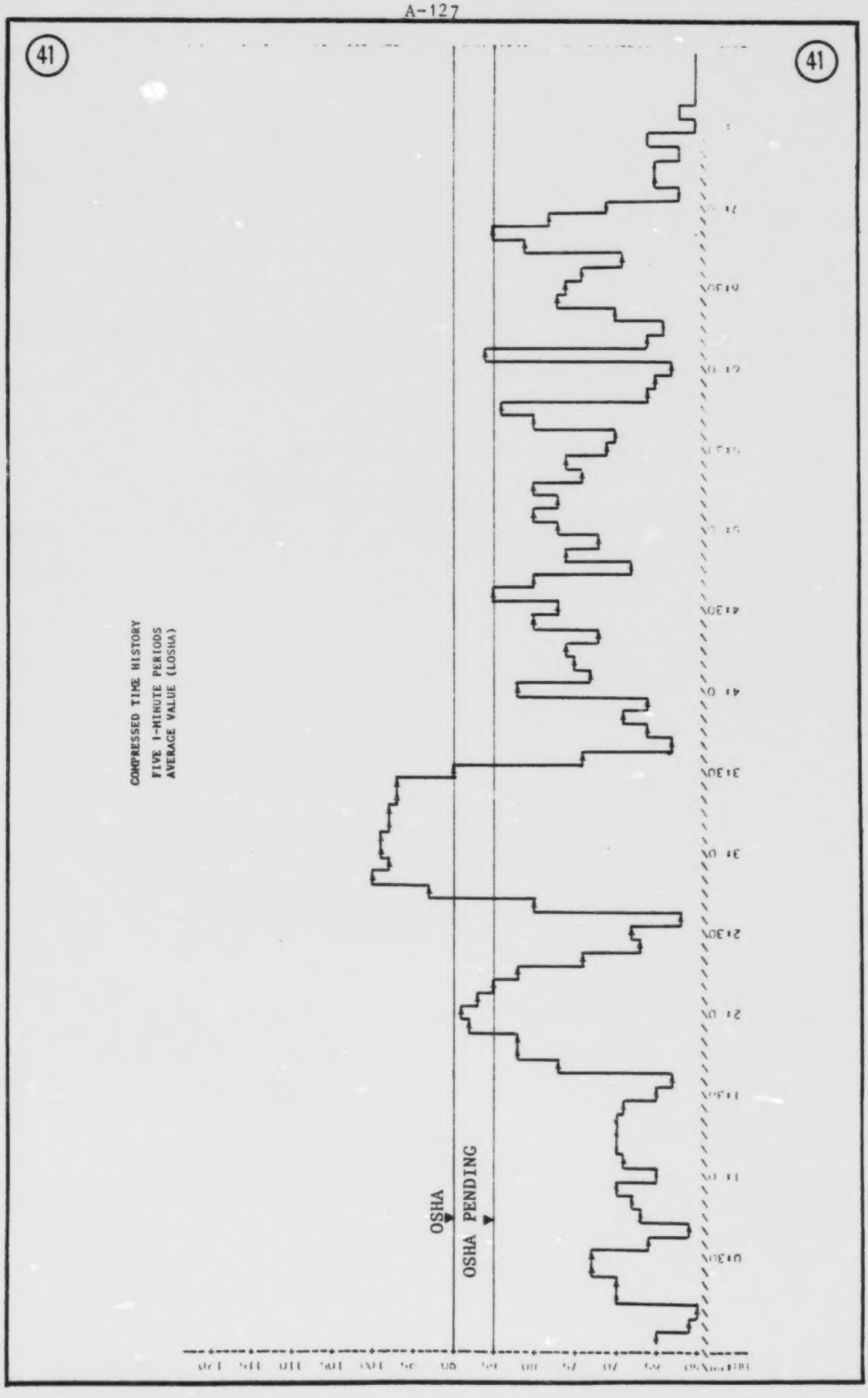
AMPLITUDE DISTRIBUTION

(41) (41)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
155	32.3	60 TO 64
77	16.0	65 TO 69
66	13.8	70 TO 74
58	12.1	75 TO 79
37	7.7	80 TO 84
36	7.5	85 TO 89
12	2.5	90 TO 94
28	5.8	95 TO 99
11	2.3	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




41
41
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(42)

PLACE TAPE IN READER (ONLY TYPE A "SPACE" AND A "RETURN"

1 26 80 1217 60 64 4 1

105 11520 440

62	61	63	72	64	66	62	60	63	65	60	60	60	63	60	60
62	60	60	65	73	78	69	70	77	72	70	76	75	73	76	77
76	75	74	77	75	78	76	75	80	79	71	76	78	80	77	75
75	76	76	74	74	66	77	76	77	60	75	65	60	60	61	60
61	63	60	60	73	77	60	77	73	75	61	60	61	61	60	63
73	66	61	72	75	66	68	65	60	62	64	65	60	61	62	60
[illegible]															
[illegible]															
93	92	91	91	91	93	92	90	75	71	82	90	85	91	85	88
94	89	90	74	82	84	90	89	89	87	89	88	90	75	89	95
93	93	94	95	96	95	96	90	89	94	90	85	89	84	90	79
[illegible]															
60	60	60	60	60	60	60	60	60	60	60	60	61	74	81	74
[illegible]															
[illegible]															
73	71	84	70	78	64	60	65	80	82	86	85	82	92	96	97
95	86	84	80	81	81	77	82	83	82	77	76	76	73	60	62
61	63	60	64	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	61	60	60	60	60	76	87	91
86	80	89	88	80	85	83	74	79	80	80	76	80	79	80	82
83	86	92	94	94	92	90	94	95	95	94	92	91	86	84	83
81	81	83	82	82	83	84	83	83	83	83	85	80	81	83	89
93	92	91	86	85	88	89	85	84	89	87	84	83	83	87	89
82	84	91	85	85	84	86	86	91	90	92	93	92	89	89	90
89	92	92	95	95	94	90	90	82	83	82	86	83	84	85	90
95	95	96	96	90	83	82	85	84	83	84	86	84	84	83	89
93	96	95	96	97	97	96	97	95	92	92	93	93	93	93	92
88	88	87	87	82	84	84	82	84	92	91	86	93	90	92	89
86	86	95	100	90	94	85	84	83	84	84	84	83	82	82	81
82	82	88	95	95	92	93	96	96	95	93	93	93	90	78	61

%EOF

(42)

ENTER LOG DATE (TD/MM/YR) : 13/09/79

ENTER SITE CODE (5 CHARS) : 39990

ENTER USER CODE (4 CHARS) : 4722
ENTER JOB CODE (3 CHARS) : 240

DATA LOGGED :13 SEPT 1979
LOGGER : DE-301/24
SERIAL NO. : 1217
[illegible]
SAMPLING RATE : 4/SEC
[illegible]

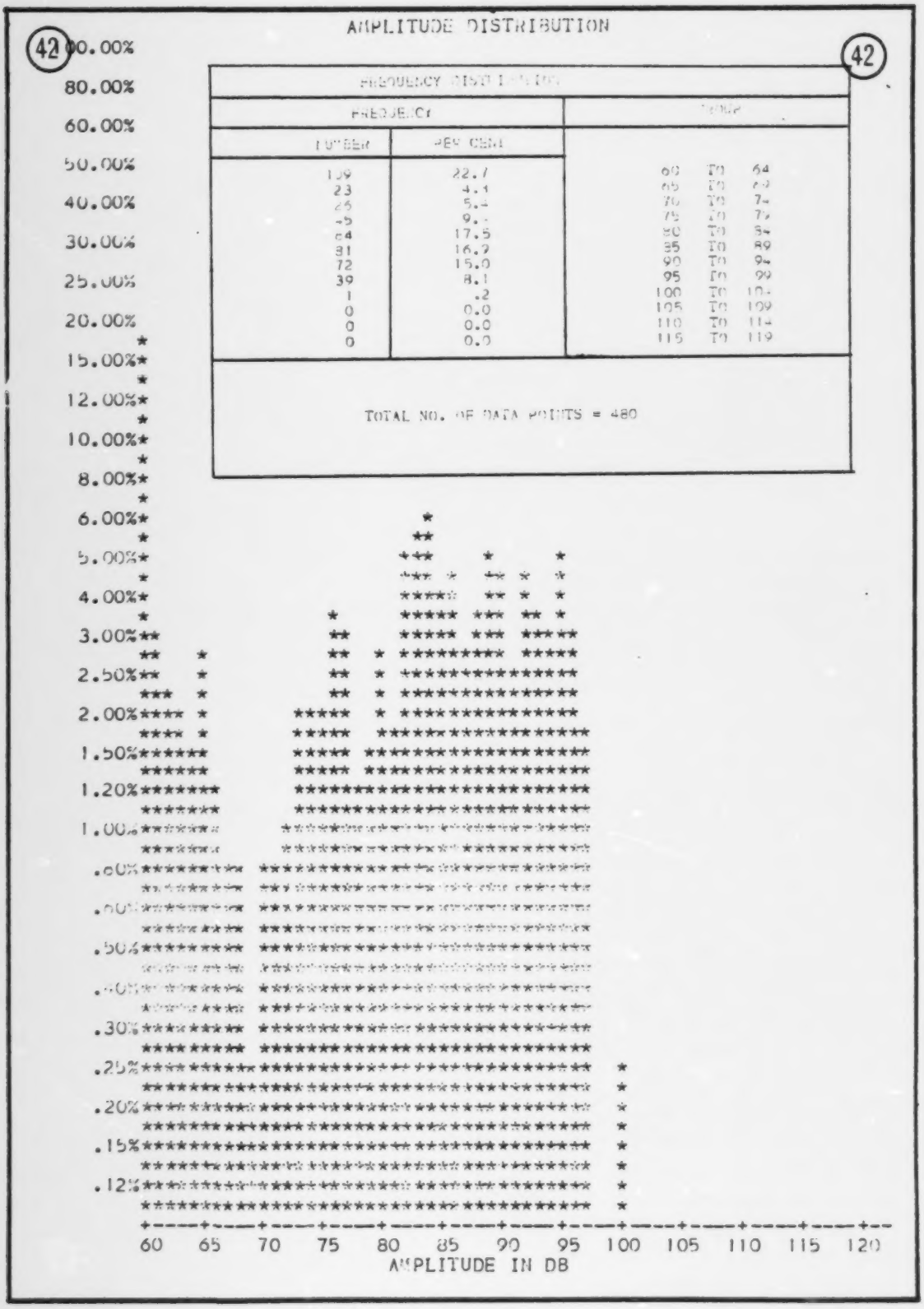
DATA ANALYZED : 27 SEPT 1979
SITE CODE : 39990
[illegible]
[illegible]
[illegible]

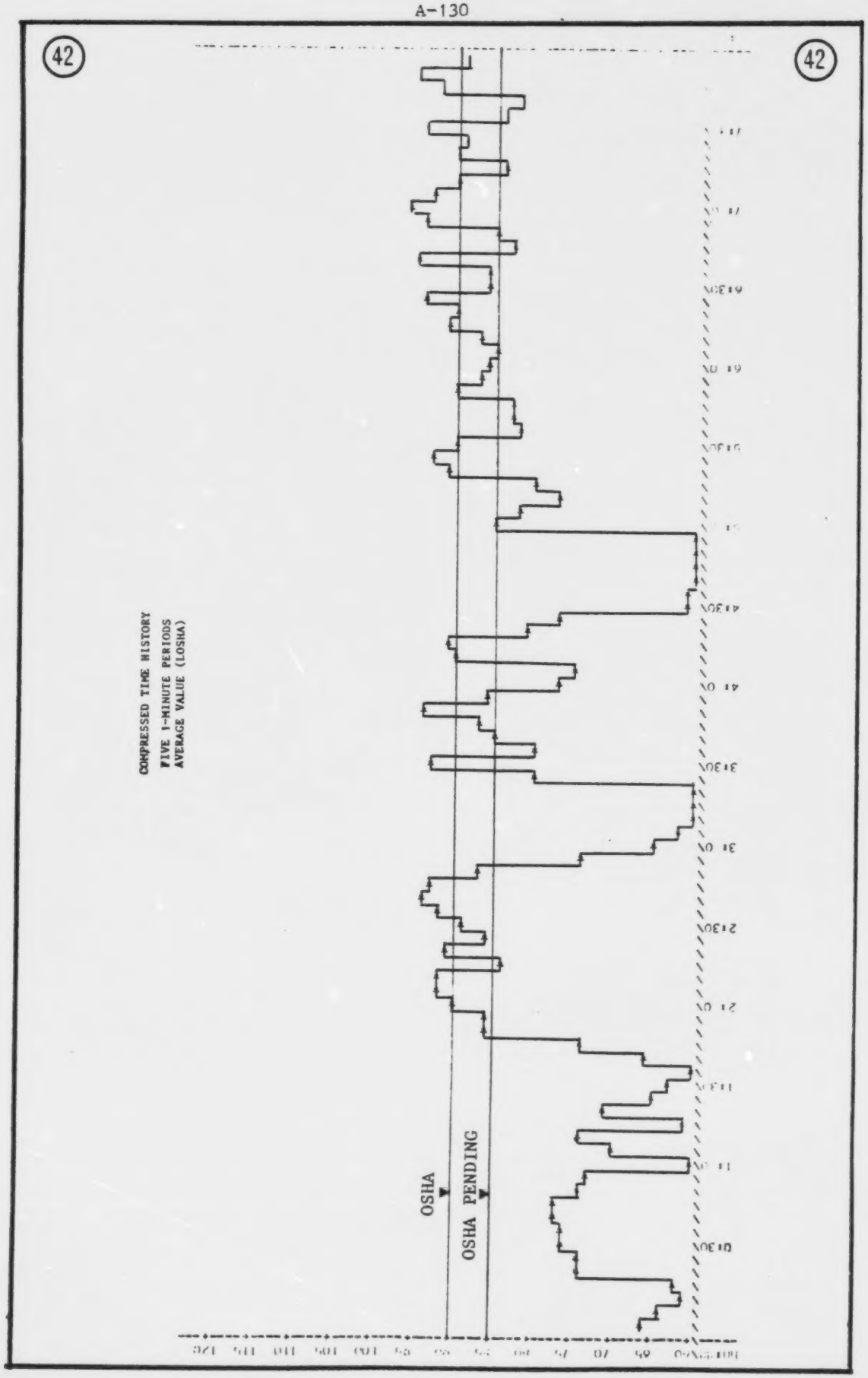
TIME HISTORY ANALYSIS

[illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

I	[illegible]	[illegible]	[illegible]	[illegible]
1	73.0	73.0	1.121	1.12
2	75.8	74.5	1.739	2.86
3	79.2	74.7	1.779	4.64
4	84.6	75.9	5.477	21.
5	85.1	76.8	3.177	24.17
6	86.9	78.0	8.115	32.27
7	89.6	79.1	11.761	44.03
8	91.0	80.2	14.921	59.09

MIN. COMP. = 60.00 MAX. COMP. = 100.00
ARITHMETIC MEAN = 76.98
STD. DEVIATION = 12.56
VARIANCE = 157.


AMPLITUDE DISTRIBUTION
42
42
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
RANGE
109 22.7 60 TO 64
23 4.1 65 TO 69
26 5.4 70 TO 74
45 9.4 75 TO 79
84 17.5 80 TO 84
81 16.9 85 TO 89
72 15.0 90 TO 94
39 8.1 95 TO 99
1 .2 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


42
42
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(43)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1222    60    64     4     1
       35      115200  480
  70  66  60  60  61  66  60  60  63  62  60  64  60  60  61  71
  74  77  61  76  71  73  70  77  77  74  79  80  76  74  72  78
  74  78  74  80  86  84  78  79  79  66  72  77  79  81  77  76
  70  75  80  78  78  77  77  76  80  73  73  74  71  71  70  70
  72  74  79  74  72  72  73  71  72  68  66  76  71  73  67  75
  76  65  74  70  64  78  71  69  77  68  63  60  67  60  69  65
  70  65  72  80  83  79  75  72  76  75  74  65   5  77  81  67
  86  86  96  91  92  88  93  91  90  90  91  96  93  91  92  91
  92  92  93  86  80  82  86  92  91  92  93  97  93  95  80  76
  88  86  95  87  84  90  92  91  94  94  96  97  92  97  91  96
  99  96  97  87  93  96  86  82  94  88  90  76  79  95  83  82
  60  60  72  73  60  60  60  66  69  63  65  61  69  67  72  76
  68  65  68  68  66  62  60  62  71  75  42  79  87  83  85  93
  96  96  97  86  79  64  85  62  73  70  91  90  86  87  92  96
  94  92  91  92  99 102 101  98  86  70  81  85  82  85  85  89
  84  74  80  87  89  87  90  89  90  98 102  99  93  88  79  75
  61  60  61  83  83  87  73  81  83  68  66  60  72  55  60  60
  60  66  60  60  60  68  60  60  65  63  60  60  60  75  67  60
  60  61  62  69  65  60  60  60  63  90  95  94  92  94  88  80
  72  82  82  83  84  85  83  80  84  83  84  87  88  93  97  98
  98  95  95  98  98  98  98  96  93  88  88  85  83  84  85  85
  85  86  88  85  86  85  91  84  84  84  90  95  98  97  95  91
  93  93  94  87  91  94  88  86  86  90  92  91  87  92  93  88
  85  88  89  92  97  95  97  96  96  95  92  93  95  99  99 101
 101 100  95  94  86  86  87  91  87  87  91  98 101 101 102 100
  90  85  87  89  87  86  87  92  87  86  89  93 103 102 100 104
 104 102 102 102  98  94  92  97  96  94  94  95  95  93  94  90
  89  87  88  83  86  90  89  94  90  93  89  93 100  99 101  99
  95  95  86  86  85  84  84  84  84  83  84  84  83  84  94  99
  98  94  96  99  98  97  95  96  92  91  76  69  76  69  75  68
%EOF
```

(43)

```
ENTER LOG DATE (DD/MM/YR) : 13/09/79
ENTER SITE CODE (5 CHARS) : 39990
ENTER USER CODE (4 CHARS) : 2277
 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :13 SEPT 1979
        LOGGER : DS-301/26
SERIAL NUMBER : 1222
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8: 0: 0
```

```
DATA ANALYZED : 27 SEPT 1979
     SITE CODE : 39990
      JOB CODE : 240
     USER CODE : 2277
    CHANNEL # : 480
TOTAL SAMPLES =  115200
 STARTED AT =   0: 0: 0
```

TIME HISTORY ANALYSIS

JOB FREQUENCY INDEX (F.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
[illegible] = 90 DB / octave
[illegible] (20 TO 2) = 45 DB
[illegible] (Center) F. = [illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

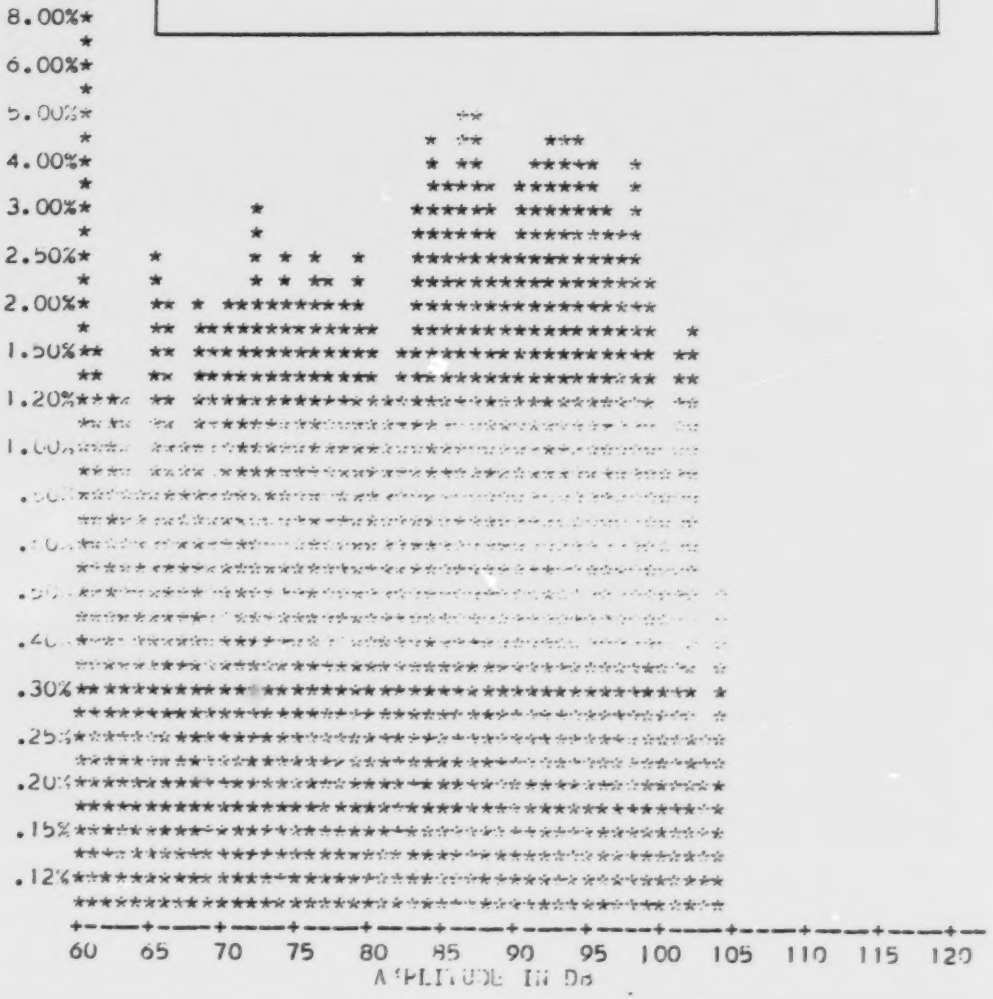
FREQ.	LOCAL		DOSE	
CODE	INCREMENTAL	CUMULATIVE	CUMULATIVE	CUMULATIVE
1	79.0	79.0	1.573	1.57
2	80.6	78.4	3.415	4.99
3	91.4	85.5	15.111	20.10
4	85.2	83.3	9.78[illegible]	29.89
5	84.0	83.0	5.920	35.81
6	91.2	87.1	14.649	50.50
7	95.9	89.3	26.383	76.88
8	92.7	89.8	18.162	97.04

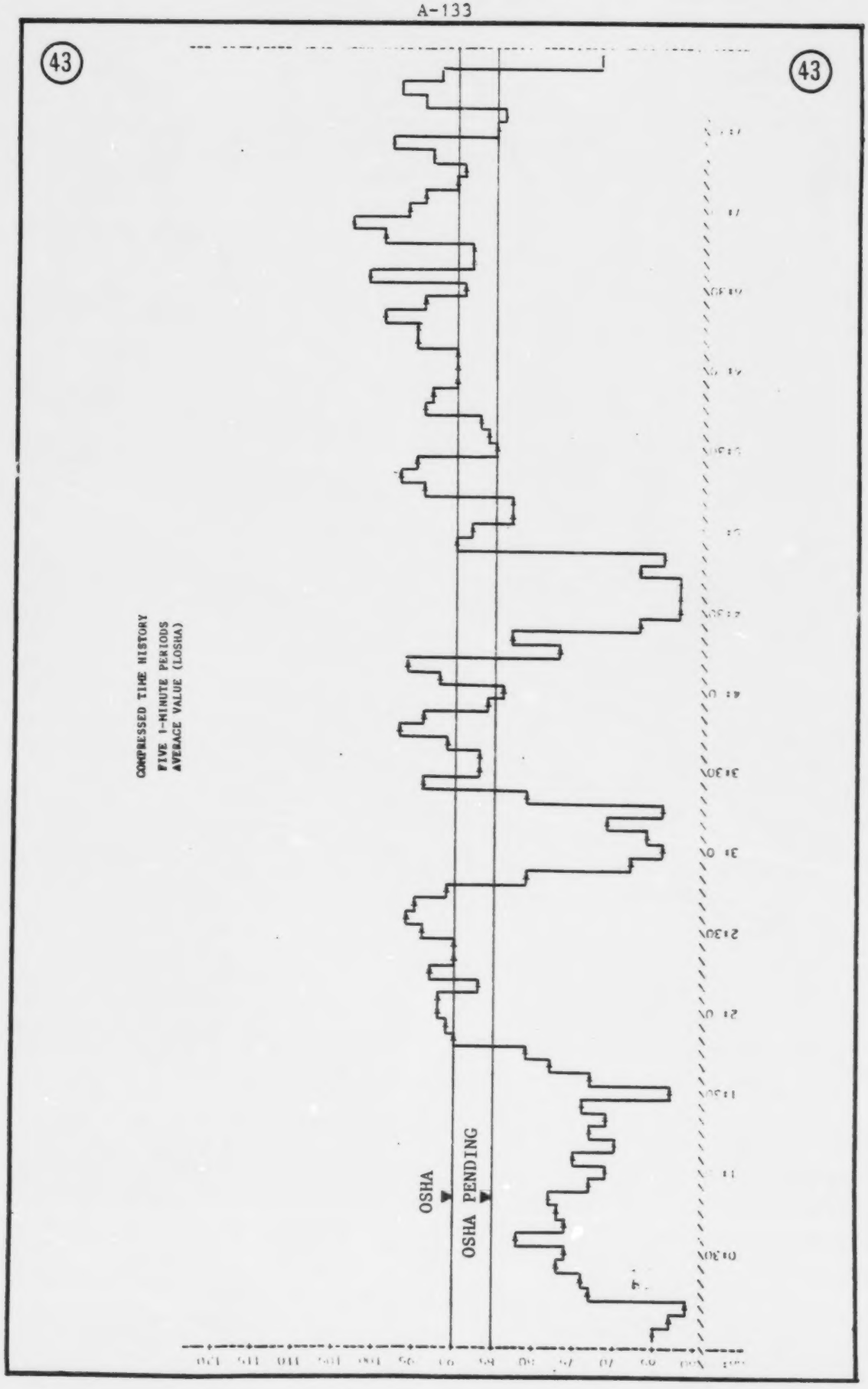
FREQ. CODE = 50 DB DOSE = 194 DB
ARITHMETIC MEAN = 82 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

AMPLITUDE DISTRIBUTION

(43)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
56	11.7	60 TO 64
37	7.7	65 TO 69
46	9.6	70 TO 74
45	9.4	75 TO 79
48	10.0	80 TO 84
81	16.9	85 TO 89
83	17.3	90 TO 94
64	13.3	95 TO 99
20	4.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




43
43
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(44)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1224    60    64     4     1
      87      115200  480
 61  60  60  60  60  67  66  65  60  60  60  61  63  60  60  62
 60  60  60  60  60  60  67  72  76  60  74  65  71  67  70  67
 64  71  68  71  69  69  74  70  67  77  62  63  70  76  64  65
 60  67  62  62  60  60  65  67  68  66  75  70  62  62  61  60
 65  70  62  60  60  60  60  60  60  60  64  64  61  60  60  60
 61  60  60  60  60  60  71  64  61  65  63  60  60  63  63  64
 60  61  60  60  60  60  60  60  60  67  60  60  60  60  60  60
 60  60  60  66  69  63  63  60  64  60  63  70  66  67  67  66
 91  89  86  86  86  83  83  86  84  81  85  82  77  84  78  67
 60  60  67  74  76  80  60  60  66  66  60  60  60  60  61  70
 60  61  64  60  60  60  60  60  80  88  98  87  98  94  93  96
 94  95  96  96  95  95  96  95  90  96  93  92  93  94  96  95
 94  91  93  94  93  90  97  94  95  92  93  91  95  93  94  95
 90  82  74  64  68  89  75  70  77  92  72  69  61  60  92  69
 60  60  60  93  80  60  60  60  94  87  60  60  60  60  60  60
 60  60  60  71  74  94  72  60  60  60  70  89  83  72  78  81
 83  78  66  83  92  90  76  62  76  75  64  90  90  74  79  80
 61  97  81  60  60  74  83  72  94  82  79  83  97  85  95  67
 60  60  60  60  60  60  76  75  74  67  60  68  60  60  60  60
 63  62  64  60  60  60  60  60  60  60  60  67  75  70  77  60
 60  60  81  83  60  60  60  60  61  60  60  60  60  60  81  87
 60  60  60  60  60  60  60  60  66  66  72  66  76  70  60  62
 60  64  62  62  60  73  74  67  68  74  61  60  60  60  64  78
 77  74  71  60  79  89  88  86  80  70  60  60  60  60  79  87
 70  63  70  68  76  62  68  78  79  60  60  77  72  71  76  78
 60  60  64  66  60  79  77  78  82  62  60  81  79  78  80  88
 93  83  80  63  75  74  81  70  60  63  65  69  75  60  83  83
 60  60  67  65  69  64  69  64  60  60  60  60  61  60  60  60
 60  60  60  60  60  60  60  74  81  72  64  63  61  61  76  75
 61  60  63  60  61  60  60  60  60  60  60  63  69  69  70  68
EOF
```

(44)

```
ENTER LOG DATE (DD/MM/YR) : 13/09/79
ENTER SITE CODE (5 CHARS) : 26969
ENTER USER CODE (4 CHARS) : 4873

 ENTER JOB CODE (3 CHARS) : 240
```

```
   DATA LOGGED :13 SEPT 1979
        LOGGER : DL-301/2b
SERIAL NUMBER : 1224
      BASELINE : 60 dB
DYNAMIC RANGE : 24 dB
SAMPLING RATE :  4/sec
TEST DURATION =    0: 0: 0
```

```
DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 26969
      JOB CODE : 240
    USER CODE : 4873
    THRESHOLD : 80 dB
TOTAL EVENTS  =  11
STATION ID    =  0: 0:51
```

TIME HISTORY ANALYSIS

[illegible] EXCEEDANCE INDEX (E.E.I.) CALCULATIONS
[illegible] BASED ON [illegible] POLLUTANT
[illegible] USE = [illegible] / sec
[illegible] (1 HOUR) TIME = [illegible]
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOUD		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	67.2	67.2	.531	.53
2	62.2	65.1	.264	.79
3	65.0	65.0	6.291	7.09
4	69.4	82.9	11.504	18.59
5	63.3	83.0	4.944	23.53
6	71.6	81.9	.976	24.51
7	77.7	81.5	2.264	26.78
8	69.2	80.7	.702	27.48

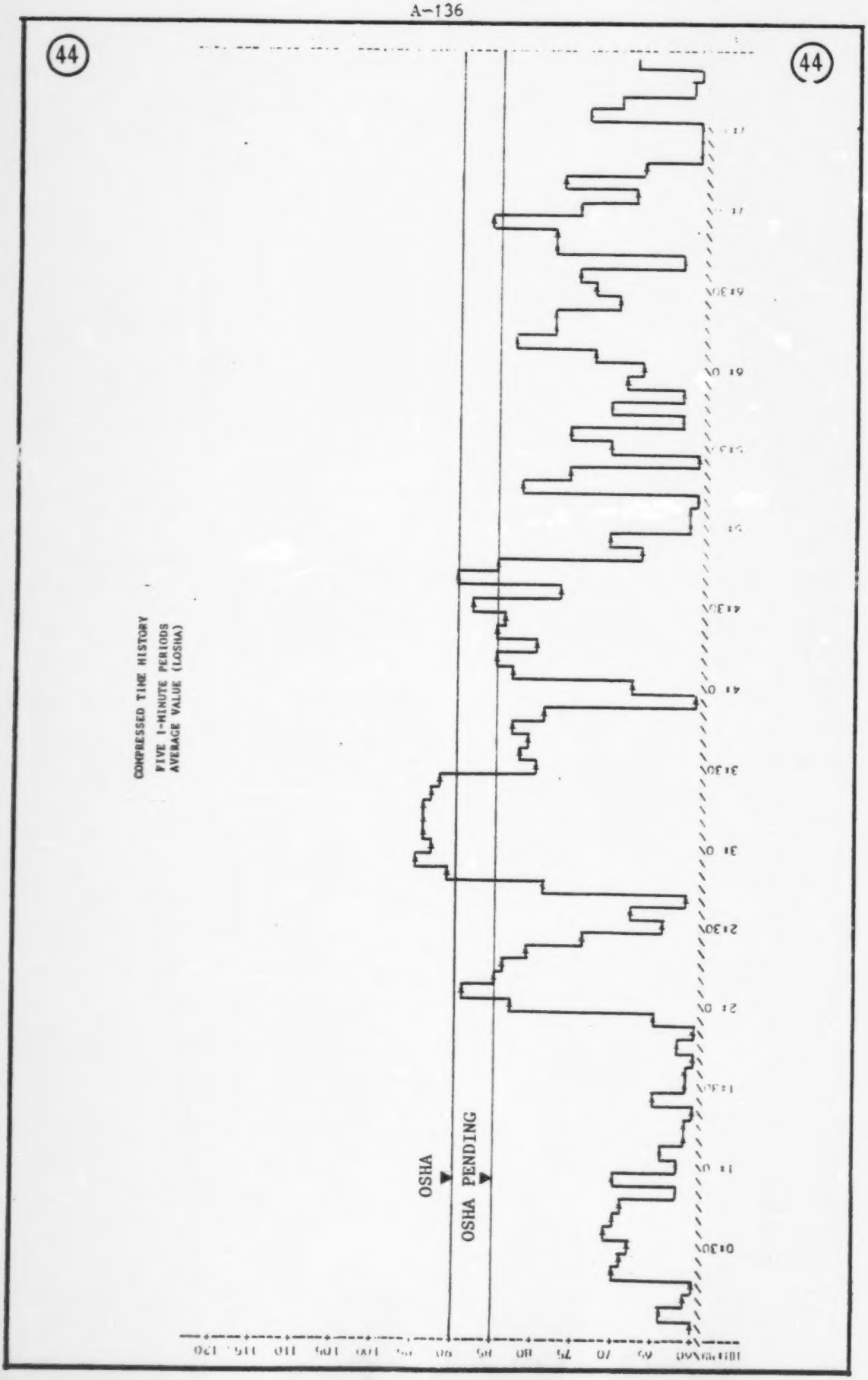
MIN. COMP. = 60 DB MAX. COMP. = 97 DB
ARITHMETIC MEAN = 70 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

AMPLITUDE DISTRIBUTION

(44) (44)

FREQUENCY DISTRIBUTION		
FREQUENCY		RANGE
NUMBER	PER CENT	
235	49.0	60 TO 64
51	10.6	65 TO 69
40	8.3	70 TO 74
39	8.1	75 TO 79
36	7.5	80 TO 84
27	5.6	85 TO 89
35	7.3	90 TO 94
17	3.5	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


44
44
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(45)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1214    60    64     4     1
      79      115200  480
  60  64  62  67  69  80  66  77  68  71  69  70  77  80  77  77
  60  65  65  60  63  61  60  70  62  61  79  90  83  79  80  86
  92  87  84  77  78  84  78  87  83  87  84  80  85  70  63  67
  64  67  70  60  60  64  69  73  66  70  64  66  73  60  67  60
  60  65  64  75  62  79  80  85  84  77  73  92  90  81  89  84
  71  70  60  88  87  68  71  75  77  61  85  71  60  60  61  62
  83  86  72  84  85  79  65  76  84  90  92  83  86  74  85  85
  89  86  78  70  66  83  80  82  66  64  64  71  71  67  71  61
  60  60  60  60  60  80  84  69  90  92  80  89  68  66  60  70
  69  69  73  74  78  83  82  79  90  92  88  86  82  80  83  70
  81  82  65  61  76  88  72  69  83  82  79  76  63  60  77  87
  60  63  68  98  96  86  82  86  82  80  77  75  78  82  90  90
  92  97  86  86  87  92  81  83  84  79  86  89  80  80  84  77
  85  79  84  82  94  86  88  78 100  91  85  65  87  73  80  64
  81  70  76  81  83  87  87  80  79  80  86  71  82  83  78  81
  87  90  93 103  87  80  87  80  82  88  98  92  84  85  78  86
  74  89  88  75  62  77  83  84  89  82  85  78  65  78  74  75
  69  71  76  76  79  88  82  88  72  69  71  87  81  62  80  62
  83  84  81  80  71  77  83  65  80  80  80  71  80  71  80  75
  63  69  81  68  80  69  78  86  80  83  75  80  82  70  86  65
  78  84  86  78  70  63  72  80  84  74  80  90  80  78  76  81
  74  75  63  64  80  76  86  82  88  85  66  70  74  81  85  86
  80  82  75  65  79  92  94  67  65  80  80  80  87  89  73  70
  60  60  60  62  80  60  60  84  82  78  76  60  60  60  60  60
  60  60  60  61  66  69  83  77  83  78  88  74  69  76  72  77
  75  76  80  87  70  76  85  79  84  76  88  75  80  68  75  72
  77  67  69  77  81  78  84  93  86  86  99 104  99  95  98 100
  90  96  97  96 102 103 101 100  95 108  92 103  97 101 102 105
 103 103 100 108  97 101  94  96  98  97 100  99  95  95  91  80
  78  84  79  79  71  80  62  70  77  79  67  89  92  70  81  79
&EOF
```

(45)

```
ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 00312

ENTER USER CODE (4 CHARS) : 4659
 ENTER JOB CODE (3 CHARS) : TCA
```

```
   DATA LOGGED :14  AUG 1979
        LOGGER : DB-301/26
SERIAL NUMBER : 1214
      BASELINE : 60 DB
DYNAMIC RANGE : 54 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8: 0: 0
```

```
DATA ANALYZED : 21 SEPT 1979
    SITE CODE : 00312
    JOB CODE : TCA
    USER CODE : 4659
    THRESHOLD : 80 DB
TOTAL SAMPLES =  115200
 STARTAY TIME =   0: 0:19
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOSH DOSE = 20 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGNA		SONE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	77.6	77.6	2.226	2.23
2	81.3	79.4	3.729	5.95
3	82.5	79.9	3.386	9.40
4	85.6	81.8	6.793	16.09
5	84.2	82.4	5.626	21.72
6	80.3	82.1	3.253	24.97
7	77.0	81.5	2.062	27.03
8	97.1	85.3	33.218	60.25

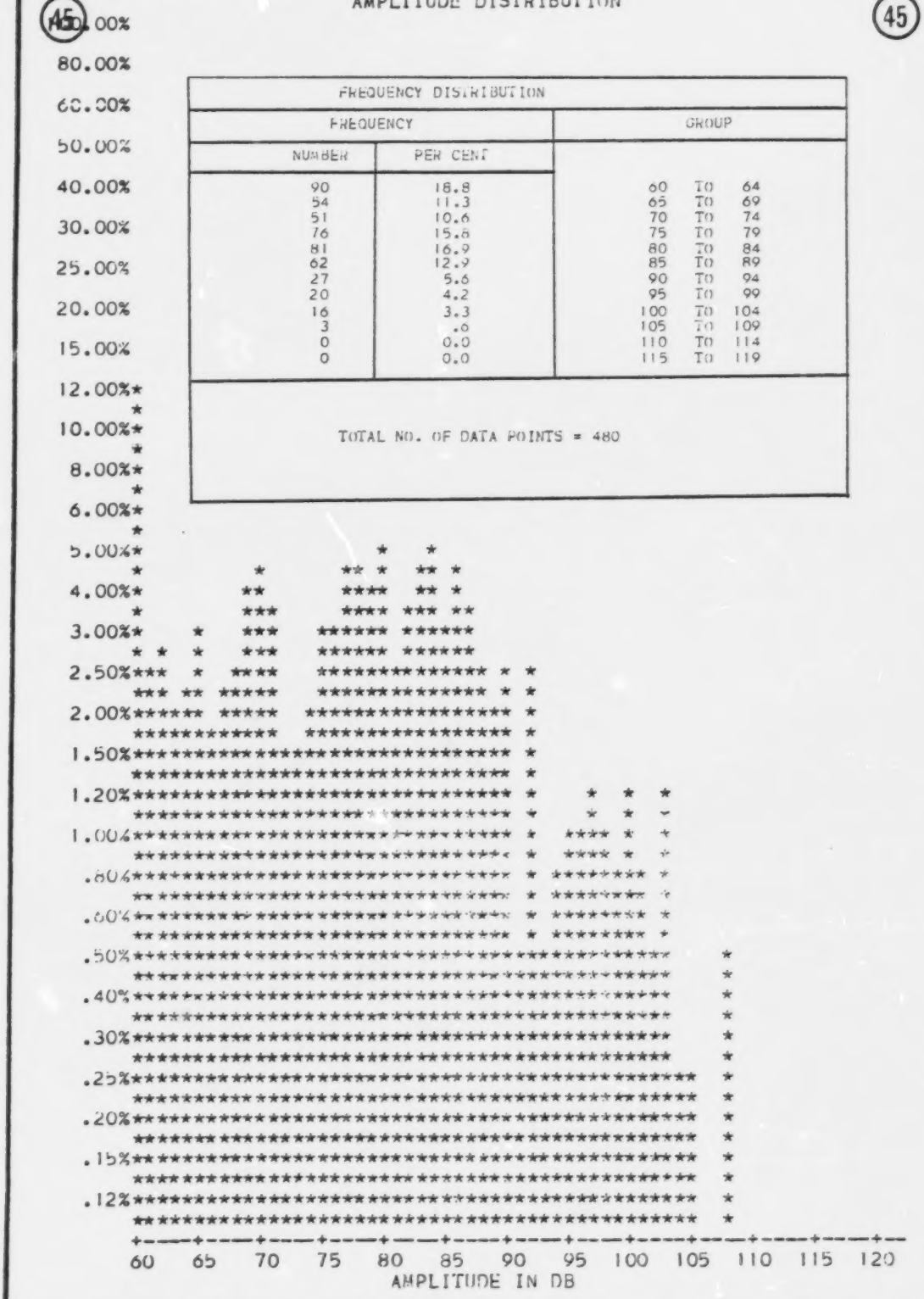
```
MIN. COMP. =  60 DB          MAX. COMP. = 108 DB
ARITHMETIC MEAN =  77 DB
STD. DEVIATION =  12 DB
VARIANCE =144 DB
```

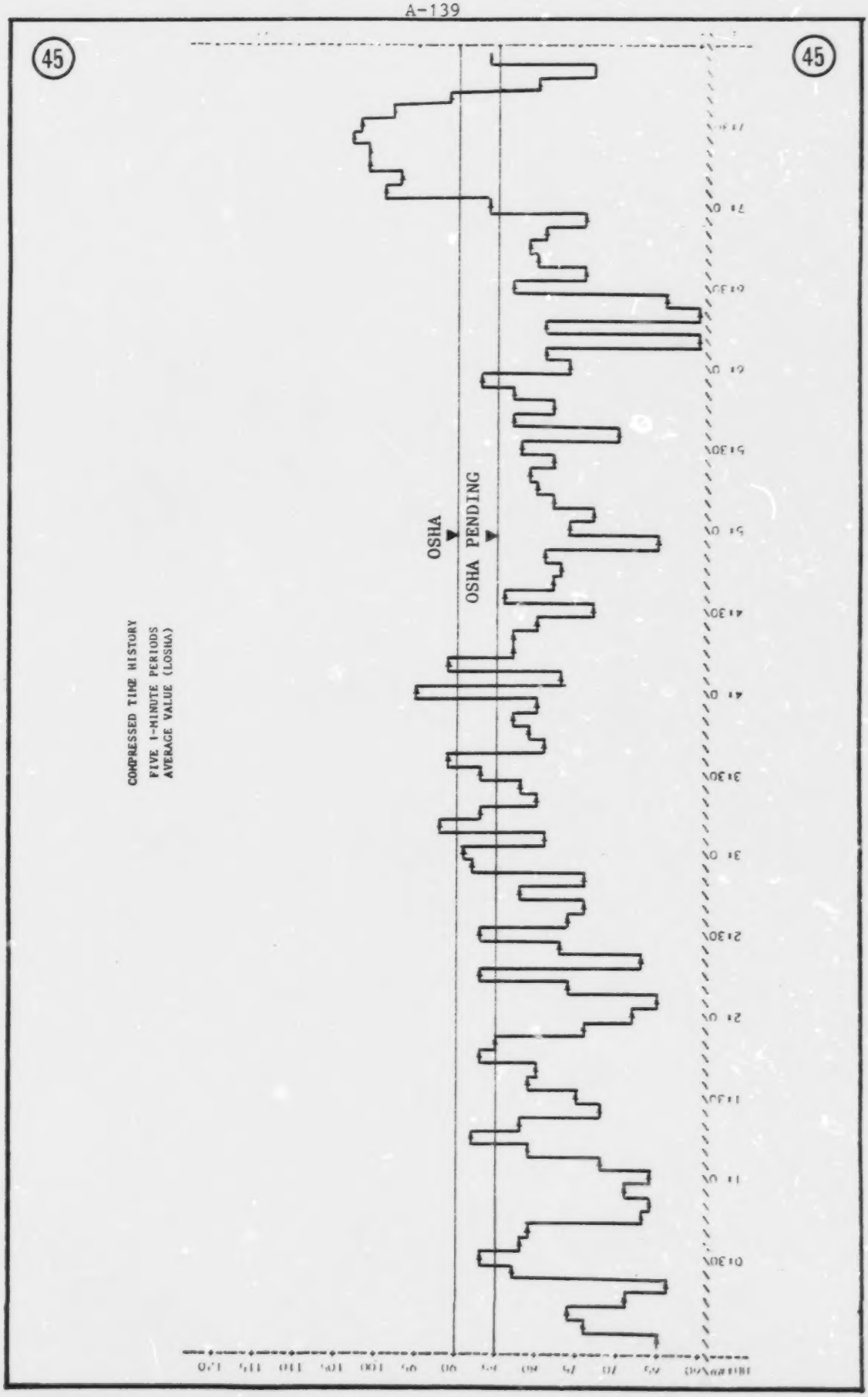
AMPLITUDE DISTRIBUTION

(45) (45)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
90	18.8	60 TO 64
54	11.3	65 TO 69
51	10.6	70 TO 74
76	15.8	75 TO 79
81	16.9	80 TO 84
62	12.9	85 TO 89
27	5.6	90 TO 94
20	4.2	95 TO 99
16	3.3	100 TO 104
3	.6	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




45
45
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(46)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(46)

```
  1  26  80  1214    60    64     4     1
      9255      115200   480
 60  63  62  73  74  83  69  62  76  67  67  61  66  79  74  68
 83  66  74  81  84  83  78  75  82  83  66  76  75  82  79  84
 85  76  72  72  79  81  81  69  82  84  78  77  76  81  98  80
 93  79  85  88  81  70  79  78  75  81  74  87  69  69  68  63
 62  73  60  60  73  72  72  66  73  73  64  65  67  72  77  66
 65  73  62  74  64  60  74  81  62  60  67  60  65  67  60  62
 61  60  60  60  61  60  60  60  60  62  66  60  62  66  60  66
 60  60  71  61  62  60  60  60  60  60  64  60  60  60  60  70
 60  60  63  60  60  60  62  67  63  65  64  63  65  60  61  60
 60  60  63  60  66  62  67  65  64  64  73  65  60  60  60  66
 60  60  62  60  60  62  67  60  62  67  63  70  60  76  65  60
 62  62  66  64  60  63  72  62  60  63  60  60  63  60  62  76
 64  63  66  60  61  60  60  69  60  60  72  62  60  61  60  60
 67  60  60  60  60  60  61  60  66  65  65  73  61  60  75  60
 60  60  60  60  63  76  71  64  70  65  75  71  79  71  64  74
 82  63  66  66  63  60  61  60  60  60  67  64  60  61  66  83
 74  60  60  61  64  69  69  62  82  60  60  60  73  60  61  60
 81  78  73  63  60  60  60  60  69  60  71  60  68  67  60  60
 60  60  60  60  60  60  61  60  60  60  60  62  60  73  60  63
 64  60  65  60  67  76  60  60  60  72  60  60  71  60  60  65
 66  65  65  71  84  70  60  69  69  60  60  60  60  60  70  60
 60  60  61  61  61  60  62  65  60  60  60  66  60  60  60  66
 70  70  60  60  60  61  60  69  70  70  62  64  60  60  60  60
 61  60  60  60  66  60  60  60  60  60  60  72  74  70  60  60
 60  60  65  60  60  60  64  75  72  60  60  69  60  66  60  65
 76  86  78  71  62  78  74  60  60  60  60  83  65  71  60  65
 81  67  60  60  60  60  68  86  80  76  63  60  60  67  60  60
 72  81  81  81  73  60  60  60  60  60  60  62  80  76  63  85
 82  63  60  60  63  62  63  60  73  60  60  60  60  84  78  77
 74  62  61  60  60  60  67  67  94  77  83  61  66  61  60  70
 60
```

```
ENTER LOG DATE (DD/MO/YR) : 23/08/79
ENTER SITE CODE (5 CHARS) : 00312
ENTER USER CODE (4 CHARS) : 4547
 ENTER JOB CODE (3 CHARS) : 296
```

```
   DATA LOGGED #23  AUG 1979          DATA ANALYZED : 25 SEPT 1979
        LOGGER : NB-301/26                 SITE CODE : 00312
SERIAL NUMBER : 1214                        JOB CODE : 296
      BASELINE : 60 DB                     USER CODE : 4547
DYNAMIC RANGE : 94 DB                   THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                  TOTAL SAMPLES =  115200
TEST DURATION =    8 H  0 M  0          STARTED TIME =    8:58:33
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TIME LOGS = 480 1 - MIN
EXCHANGE RATE ALLOWED (ER) = 5 DB
THRESHOLD (CRITERION LEVEL) = 90 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

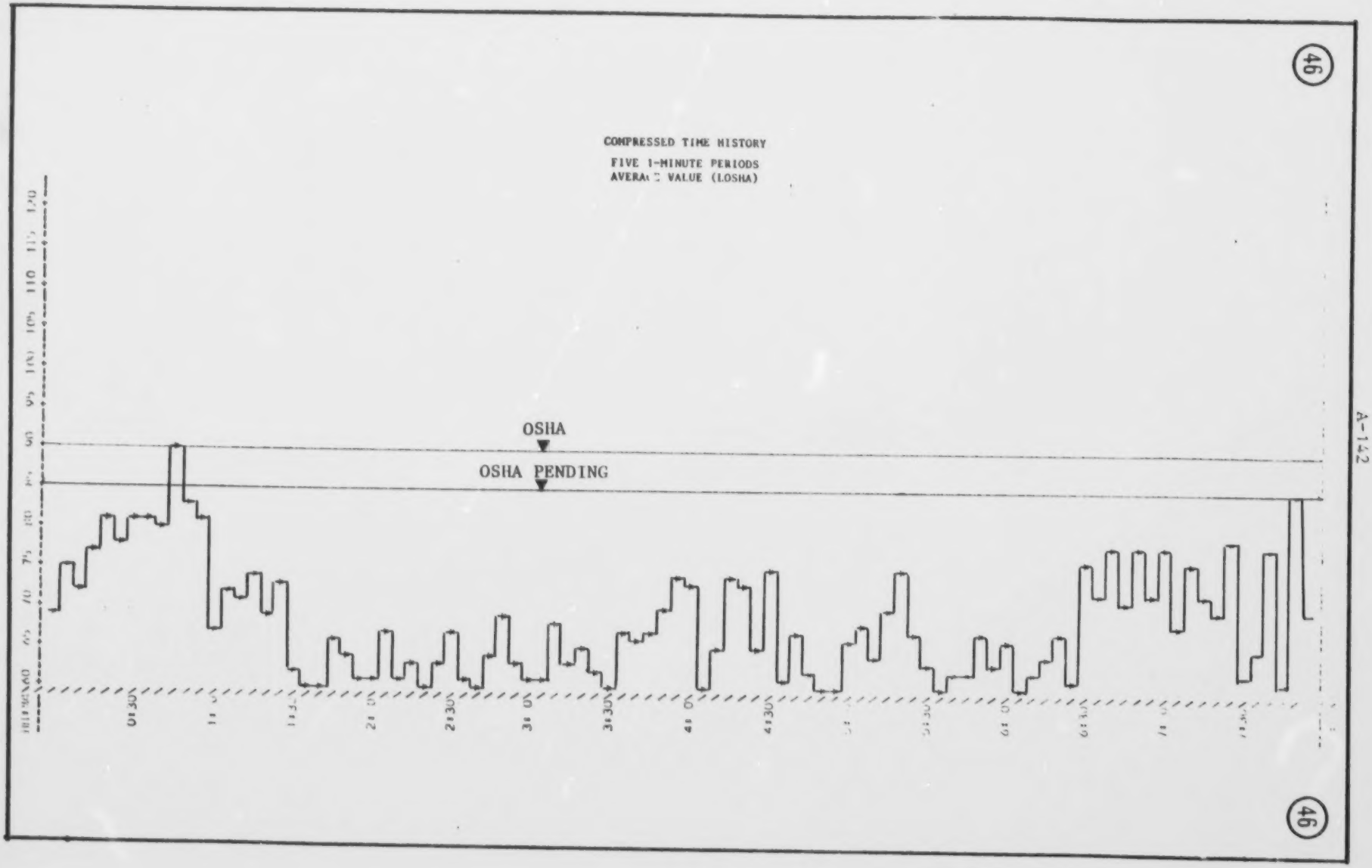
TIME	LOGS			
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	81.0	81.0	3.577	3.58
2	68.2	77.1	.611	4.19
3	63.9	74.7	.335	4.52
4	69.6	73.4	.489	5.01
5	68.5	72.7	.632	5.64
6	66.9	72.0	.506	6.15
7	71.5	71.9	.259	7.11
8	75.1	72.4	1.578	8.69

MIN. COMP. = 60 DB MAX. COMP. = 98 DB
ARITHMETIC MEAN = 66 DB
STD. DEVIATION = 8 DB
VARIANCE = 64 DB

AMPLITUDE DISTRIBUTION

(46) (46)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
275	57.3	60 TO 64
67	14.0	65 TO 69
51	10.6	70 TO 74
39	8.1	75 TO 79
36	7.5	80 TO 84
9	1.9	85 TO 89
2	.4	90 TO 94
1	.2	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


46
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
46

(47)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1   26   80   1220    60    64     4     1
      102       115200   480
  61  63  63  66  63  60  62  66  68  69  67  62  67  60  60  64
  61  60  71  70  75  80  68  76  64  77  74  65  62  65  76  70
  70  67  72  61  60  60  65  60  68  73  76  80  80  71  79  86
  79  84  85  83  83  82  83  67  63  65  79  72  60  60  60  60
  71  62  60  60  62  60  66  73  75  61  67  62  63  79  64  74
  81  79  76  61  77  75  72  79  71  67  60  73  60  65  84  65
  60  60  60  60  60  65  64  74  60  66  67  77  63  60  60  62
  60  60  60  67  60  62  71  74  60  60  63  82  81  81  82  80
  63  80  73  60  60  60  61  72  60  60  60  67  73  73  72  69
  74  73  81  79  77  75  75  80  80  79  82  82  75  74  79  72
  75  76  75  62  60  75  80  70  68  73  72  75  67  70  77  71
  79  75  72  75  73  60  75  74  79  62  60  67  79  77  65  67
  70  72  61  71  64  60  76  65  66  78  69  83  87  74  72  60
  60  66  60  60  62  60  60  76  73  60  60  62  63  75  86  76
  72  74  69  82  77  71  82  72  79  72  81  78  68  67  70  81
  80  71  84  69  78  82  78  79  81  78  60  63  72  65  77  71
  63  73  81  72  60  60  61  60  70  70  64  60  82  71  75  69
  74  71  82  60  74  80  84  81  73  81  85  83  78  81  82  81
  81  79  84  66  73  70  65  73  68  73  63  78  68  67  68  80
  73  72  80  60  67  63  68  69  67  72  71  77  74  76  70  60
  60  60  60  60  60  74  63  66  77  62  65  82  81  89  87  86
  89  65  86  80  67  67  74  63  68  72  60  60  60  61  62  60
  60  60  69  75  60  61  67  72  77  76  83  63  60  61  81  86
  87  88  89  89  88  91  93  87  85  85  84  80  78  81  81  87
  91  95  93  94  85  83  87  78  78  78  72  77  79  63  77  79
  70  67  75  80  71  81  83  85  83  85  85  80  79  76  73  74
  75  85  79  74  71  79  82  81  70  75  72  72  75  68  76  77
  72  73  67  65  63  78  70  69  70  73  72  60  63  73  69  73
  75  74  77  68  70  79  80  79  80  79  78  75  74  72  80  79
  77  72  66  70  70  69  71  62  62  62  85  87  80  80  80  78
%EOF


ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 00323

ENTER USER CODE (4 CHARS) : 4524
 ENTER JOB CODE (3 CHARS) : 140


   DATA LOGGED :12 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
        LOGGER : DD-301/26                 SITE CODE : 00323
 SERIAL NUMBER : 1220                      JOB CODE : 140
      BASELINE : 50 DB                     USER CODE : 4524
  DYNAMIC RANGE : 64 DB                    RESOLUTION : 1 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STARTED AT =   8: 0: 0


            TIME HISTORY ANALYSIS

 NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
 ARE BASED ON THE FOLLOWING:
 TOP = 100 = 95 % / 5 %
 CRITERION (PREFERRED) LEVEL =  90 DB
 THRESHOLD (LOWEST) LEVEL =  50 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD =  1 MINUTES

 %TIME          LEVELS
 ORDER   EXCEEDED   CUMULATIVE      %TIME      CUMULATIVE
    1       74.2        74.2        1.402        1.40
    2       70.2        72.5         .801        2.20
    3       70.9        74.7        1.699        3.90
    4       74.3        74.3        1.427        5.33
    5       76.7        74.5        1.976        7.30
    6       75.4        74.7        1.642        8.95
    7       64.1        77.0        5.497       14.44
    8       70.9        76.8        1.703       16.15
 MIN. COMP. =  60 DB              MAX. COMP. =  95 DB
 ARITHMETIC MEAN =  72 DB
 STD. DEVIATION =  5.50
 VARIANCE = 30.18
```

(47)

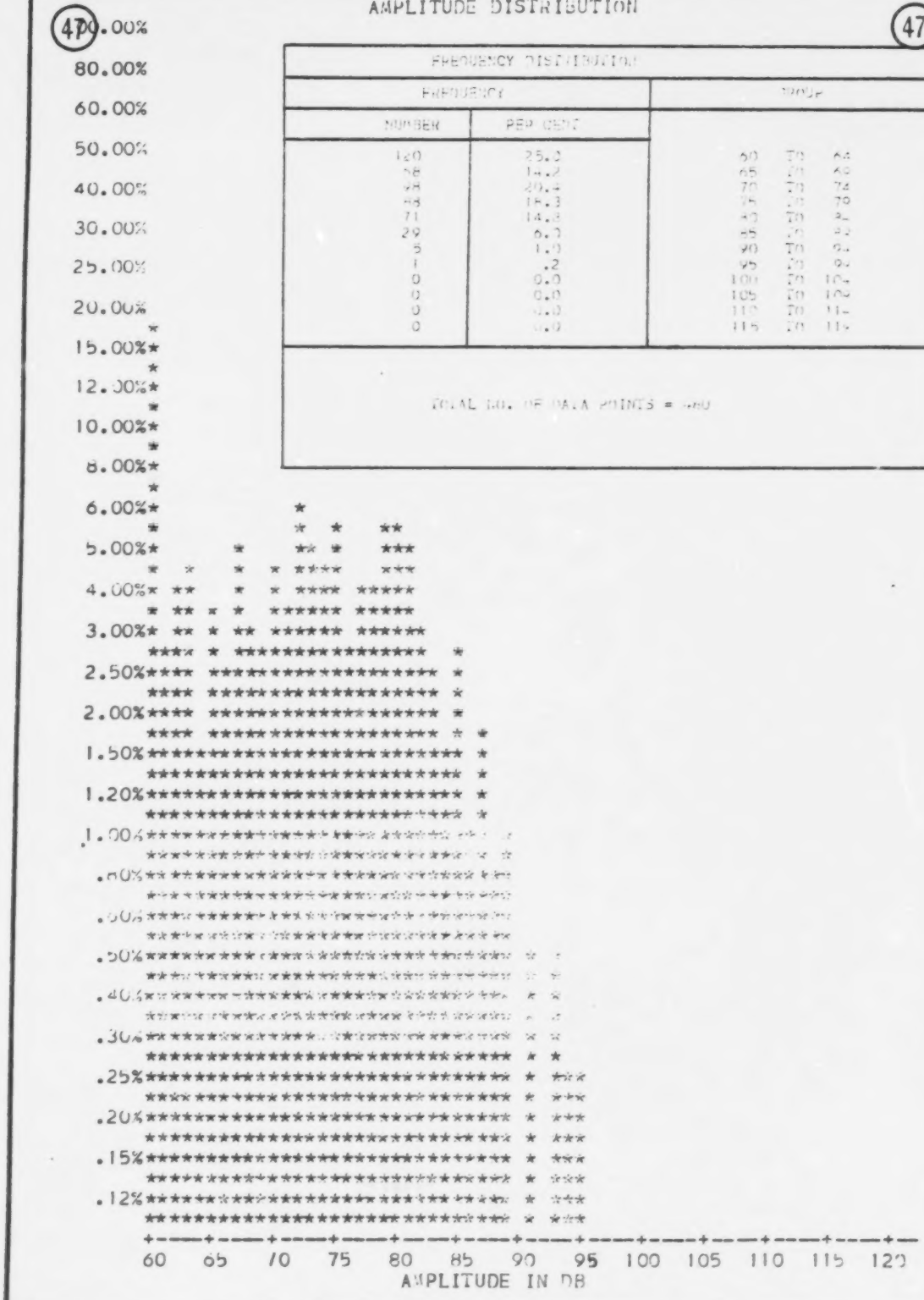
AMPLITUDE DISTRIBUTION

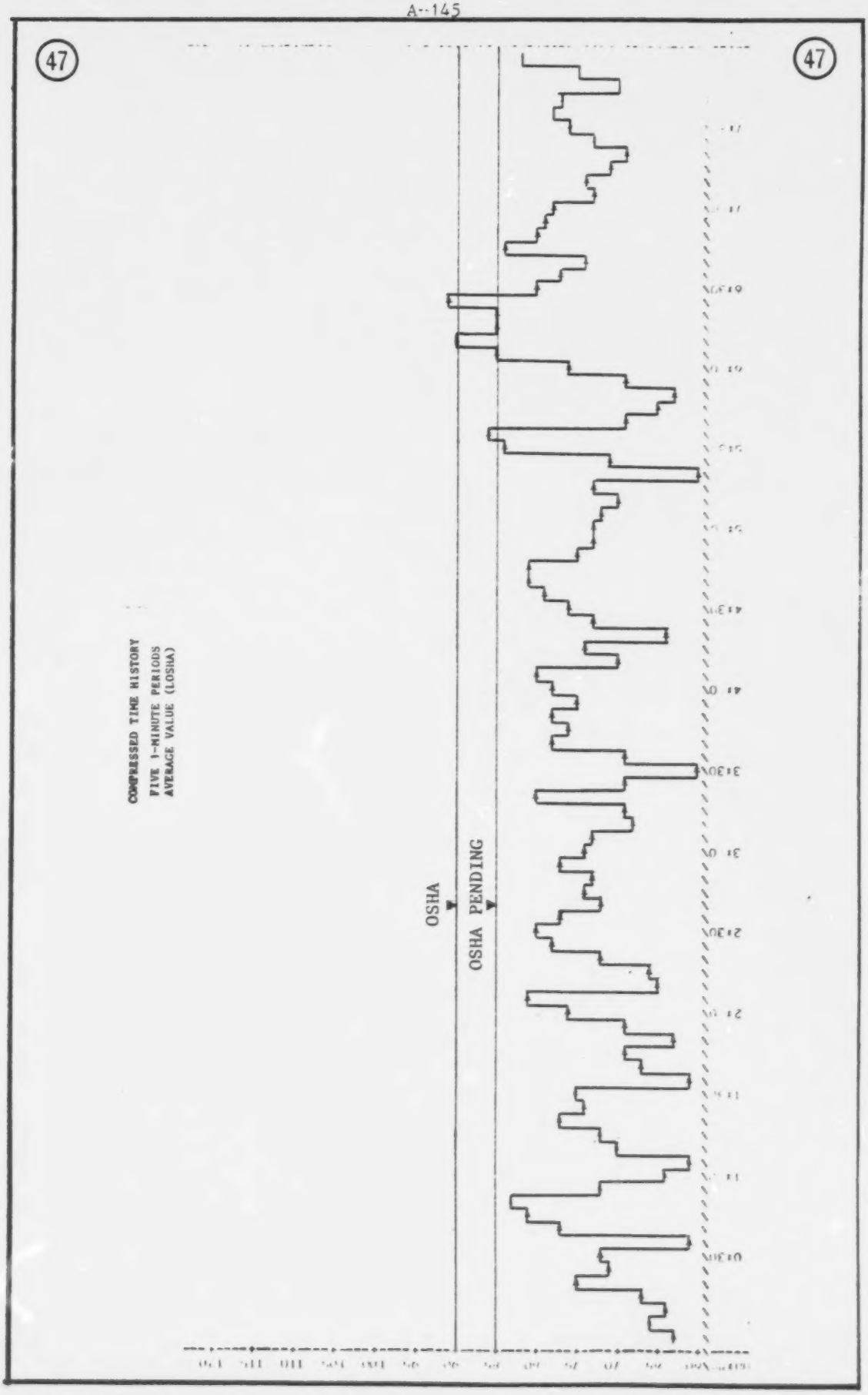
47

FREQUENCY DISTRIBUTION

FREQUENCY		RANGE
NUMBER	PER CENT	
120	25.2	60 TO 64
68	14.2	65 TO 69
98	20.4	70 TO 74
88	18.3	75 TO 79
71	14.8	80 TO 84
29	6.0	85 TO 89
5	1.0	90 TO 94
1	.2	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




47
47
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(48)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226    60    64     4     1
      67     115200  480
 63  63  61  68  66  67  74  70  62  69  69  66  76  69  65  66
 69  69  66  61  67  72  80  83  75  80  82  69  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  64  61  60  69  61  61
 60  60  66  60  60  62  60  71  84  77  79  89  74  60  78  76
 80  79  65  66  75  84  81  78  62  60  64  66  67  76  63  72
 72  67  64  60  62  65  61  60  60  66  70  69  76  60  72  69
 78  60  63  60  62  73  60  76  78  78  71  61  72  66  67  61
 82  86  78  76  82  80  60  60  60  60  60  67  65  60  60  60
 60  60  63  60  60  61  60  68  84  85  71  60  60  60  79  60
 60  60  66  71  74  78  60  60  60  60  60  60  60  60  60  60
 73  66  60  85  82  65  67  77  63  60  60  60  60  60  60  60
 60  60  61  68  72  67  60  60  60  61  66  60  60  69  60  60
 60  60  60  60  60  60  60  76  66  78  69  64  60  60  60  61
 60  60  61  60  62  60  60  60  60  60  61  60  69  60  60  60
 60  60  60  60  67  61  60  72  69  77  60  60  60  67  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  62  60  60  60
 73  60  60  85  76  79  85  78  60  60  63  60  60  60  60  60
 61  71  63  69  62  60  60  60  61  61  60  60  61  60  60  60
 61  60  60  60  60  60  60  72  66  85  78  75  80  66  67  60
 60  61  68  60  63  82  84  75  62  67  91  78  60  60  60  60
 60  61  60  68  69  81  60  60  60  62  60  84  60  60  67  76
 78  60  69  60  62  69  60  60  60  60  63  60  60  66  67  76
 70  70  75  60  60  60  60  60  64  60  60  60  60  60  70  60
 62  60  60  60  60  60  60  60  60  61  60  68  67  60  60  60
 60  60  62  60  60  73  60  60  60  60  83  72  60  60  60  60
 60  60  60  60  62  60  60  60  60  60  60  60  61  62  60  60
 60  60  60  60  60  67  65  60  60  60  65  66  74  60  60  60
 67  63  64  62  61  60  60  60  61  60  60  60  63  61  63  62  64
 60  60  60  60  64  60  60  61  60  60  60  64  60  60  60  60
 62  60  60  60  60  60  60  60  60  60  60  69  76  79  75  77  74
%EOF
```

(48)

```
ENTER LOG DATE (DD/MM/YR) : 26/07/79
ENTER SITE CODE (5 CHARS) : 2SHAF

ENTER USER CODE (4 CHARS) : 7006
 ENTER JOB CODE (3 CHARS) : 291
```

```
   DATA LOGGED :26 JULY 1979
        LOGGER : DB-301/26
 SERIAL NUMBER : 1226
      BASELINE : 60 DB
 DYNAMIC RANGE : 64 DB
 SAMPLING RATE :  4/SEC
 TEST DURATION =   0: 0: 0

 DATA ANALYZED : 19 SEPT 1979
     SITE CODE : 2SHAF
      JOB CODE : 291
     USER CODE : 7006
     THRESHOLD : 80 DB
 TOTAL SAMPLES = 115200
  STANDBY TIME =   0: 0:16
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGHA		XDOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	72.4	72.4	1.090	1.09
2	75.6	74.2	1.701	2.79
3	74.1	74.2	1.385	4.18
4	64.6	72.1	.380	4.56
5	69.5	72.2	.724	5.28
6	74.4	72.6	1.433	6.71
7	63.8	71.8	.331	7.04
8	65.3	71.3	.406	7.45

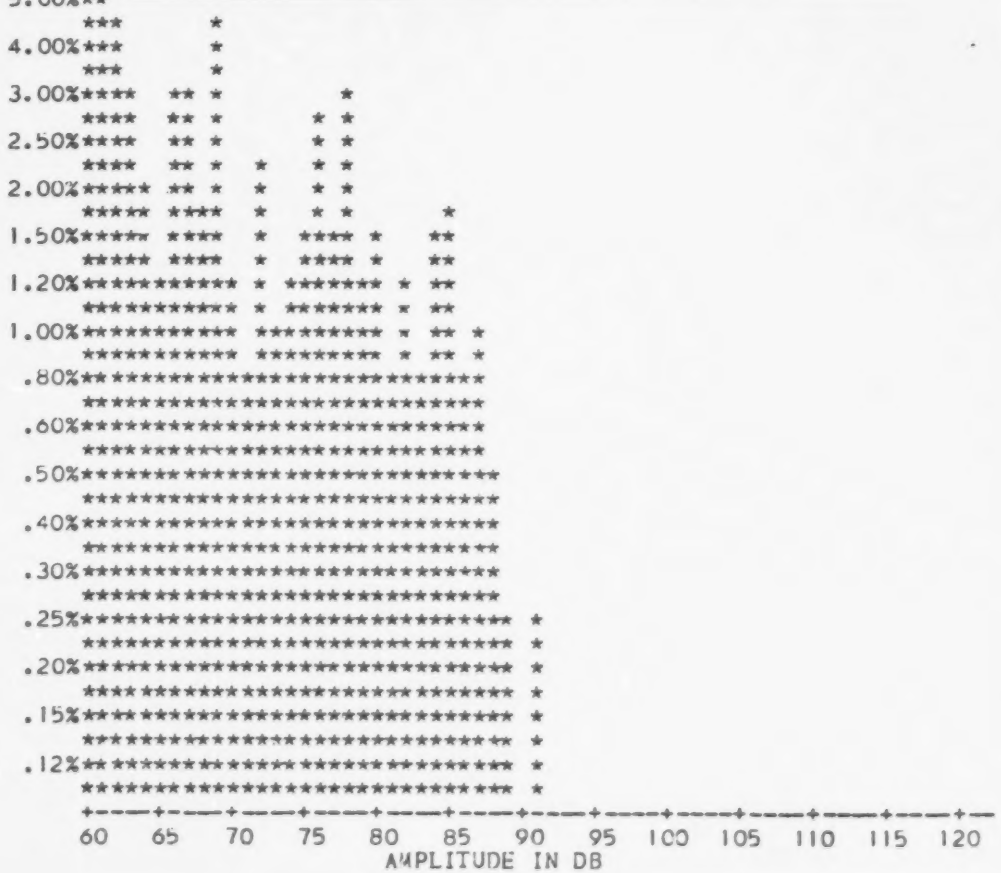
MIN. COMP. = 60 DB
MAX. COMP. = 91 DB
ARITHMETIC MEAN = 65 DB
STD. DEVIATION = 8 DB
VARIANCE = 64 DB

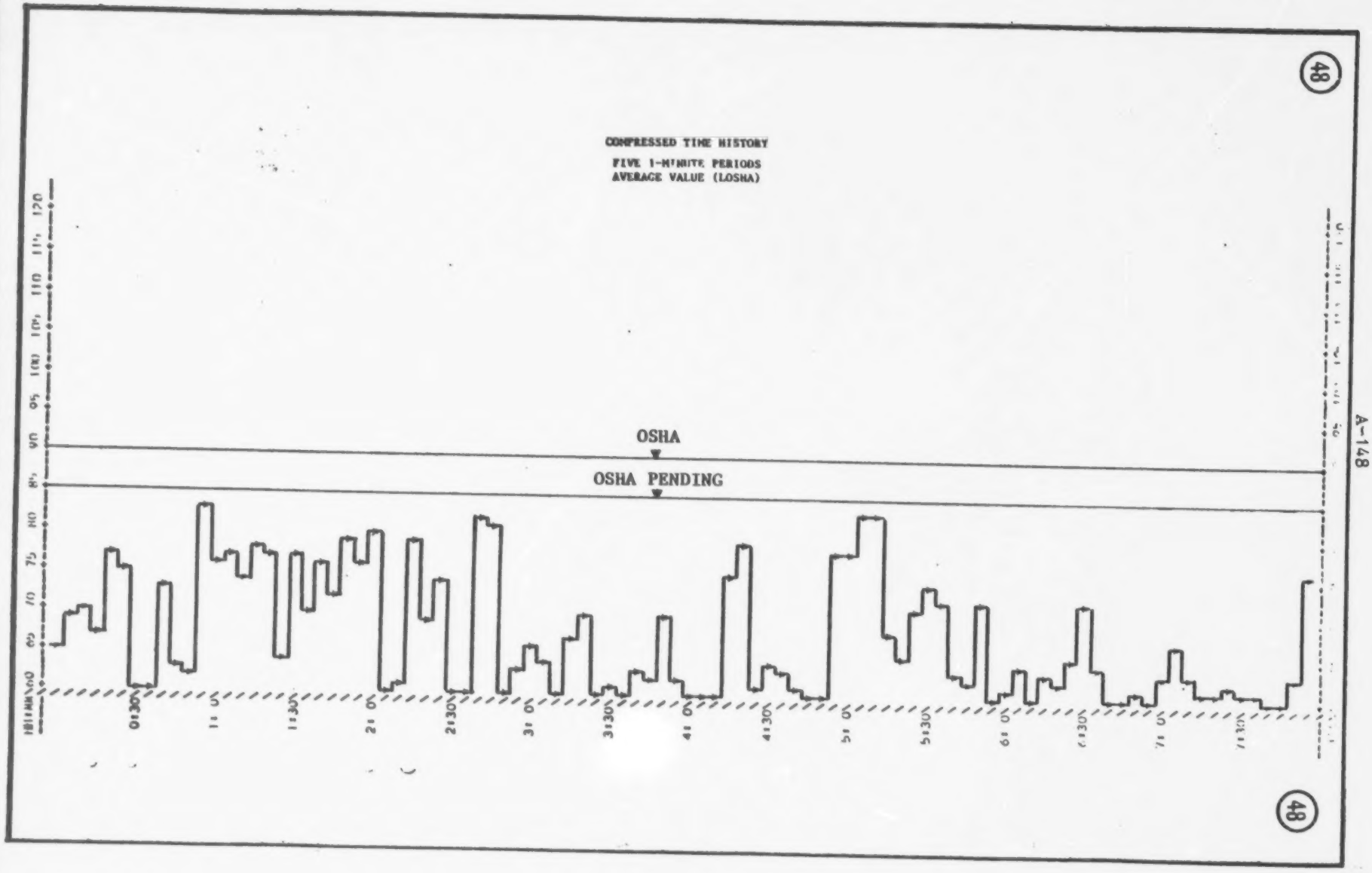
AMPLITUDE DISTRIBUTION

(48) (48)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
318	66.2	60 TO 64
55	11.5	65 TO 69
26	5.4	70 TO 74
40	8.3	75 TO 79
23	4.8	80 TO 84
17	3.5	85 TO 89
1	.2	90 TO 94
0	0.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




48
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
48

(49)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214   60   64    4    1
     323     115200  480
 102  97  60  75  60  60  60  60  60  66  60  60  60  60  60  60
  60  60  60  60  60  60  61  67  60  61  67  60  65  70  72  60
  62  64  60  69  60  61  60  60  66  76  60  63  66  60  68  60
  64  67  60  60  60  69  71  60  72  64  64  71  71  73  73  61
  63  63  60  60  63  60  60  60  73  71  63  66  72  78  82  65
  74  82  86  95  77  70  75  79  98  85  73  60  67  91 102  93
  80  88  83  69  61  69  86  67  83  89  82  92  71  82  85  86
  91  91  90  89  91  91  90  90  90  95  98  90  90  85  88  90  93
  90  96  92  99  96 100  98  77  82  81  80  87  80  82  84  88
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  70  68
  89  84  81  79  85  86  83  84  87  75  81  70  77  80  83  82
  82  82  77  69  74  78  74  68  79  84  92  80  88  78  67  75
  80  80  81  74  76  77  75  80  83  83  88  88  92  76  74  73
  75  74  77  71  80  77  75  79  78  82  81  79  76  76  62  64
  70  62  72  75  67  80  78  71  70  78  74  69  79  80  85  79
  80  84  81  82  80  79  81  78  77  82  74  78  83  76  74  88
  90  91  89  90  87  80  80  80  80  80  80  80  80  80  80  80
  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80
  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80
  80  80  80  80  80  80  80  72  87  90  88  88  87  92  88  89
  79  77  80  89  78  71  71  76  81  80  82  75  72  76  65  80
  69  65  75  76  77  68  67  62  83  87  83  82  83  82  93  97
  97  97  98  97  89  91  91  91  90  90  90  90  90  90  90  89
  89  72  81  67  71  81  76  86  90  90  88  89  90  90  91  90
  91  92  89  88  81  68  61  60  66  80  73  78  84  89  90  88
  87  92  89  72  74  78  81  86  86  85  82  80  71  84  76  75
  79  81  81  79  82  82  79  94  93  94  94  93  93  89  89  90
  90  90  91  89  88  87  86  86  85  82  87  86  88  89  70  70
  69  78  80  78  78  79  71  60  69  64  78  81  77  74  62  60
  69  71  67  69  63  63  75  67  61  80  77  80  80  80  80  80
NOW

ENTER LOG DATE (DD/MM/YR) : 27/08/79
ENTER SITE CODE (5 CHARS) : ISHOS
ENTER USER CODE (4 CHARS) : 0474
 ENTER JOB CODE (3 CHARS) : 018

   DATA LOGGED :27  AUG 1979          DATA ANALYZED : 26 SEPT 1979
        LOGGER : DR-301/26                SITE CODE : ISHOS
 SERIAL NUMBER : 1214                      JOB CODE : 018
      BASELINE : 60 DB                    USER CODE : 0474
 DYNAMIC RANGE : 64 DB                   THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =  8 HR 0 M              STANDBY TIME =  0 HR 1 M

            TIME HISTORY ANALYSIS

NOTE: EXPOSURE INDEX (E.P.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

          LEQ(A                          %DOSE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1       76.8       76.8        2.017        2.02
   2       88.9       85.1       10.726       12.74
   3       84.5       86.4       10.180       22.92
   4       79.8       85.3        3.040       25.96
   5       76.9       84.2        2.024       27.99
   6       85.1       84.5        6.879       34.87
   7       85.8       84.7        6.959       41.83
   8       84.2       84.6        5.570       47.39
MIN. COMP. =  60 DB              MAX. COMP. = 102 DB
ARITHMETIC MEAN =  76 DB
STD. DEVIATION =  12 DB
VARIANCE =144 DB
```

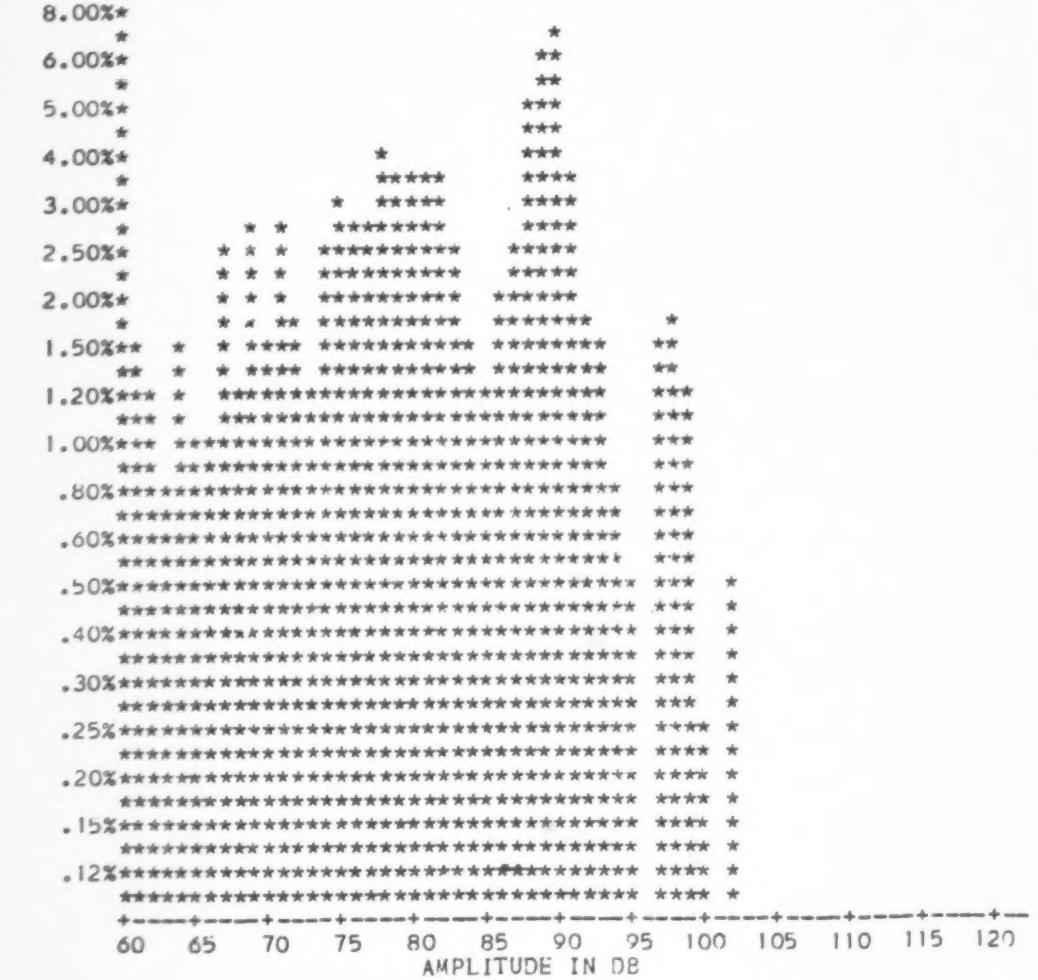
(49)

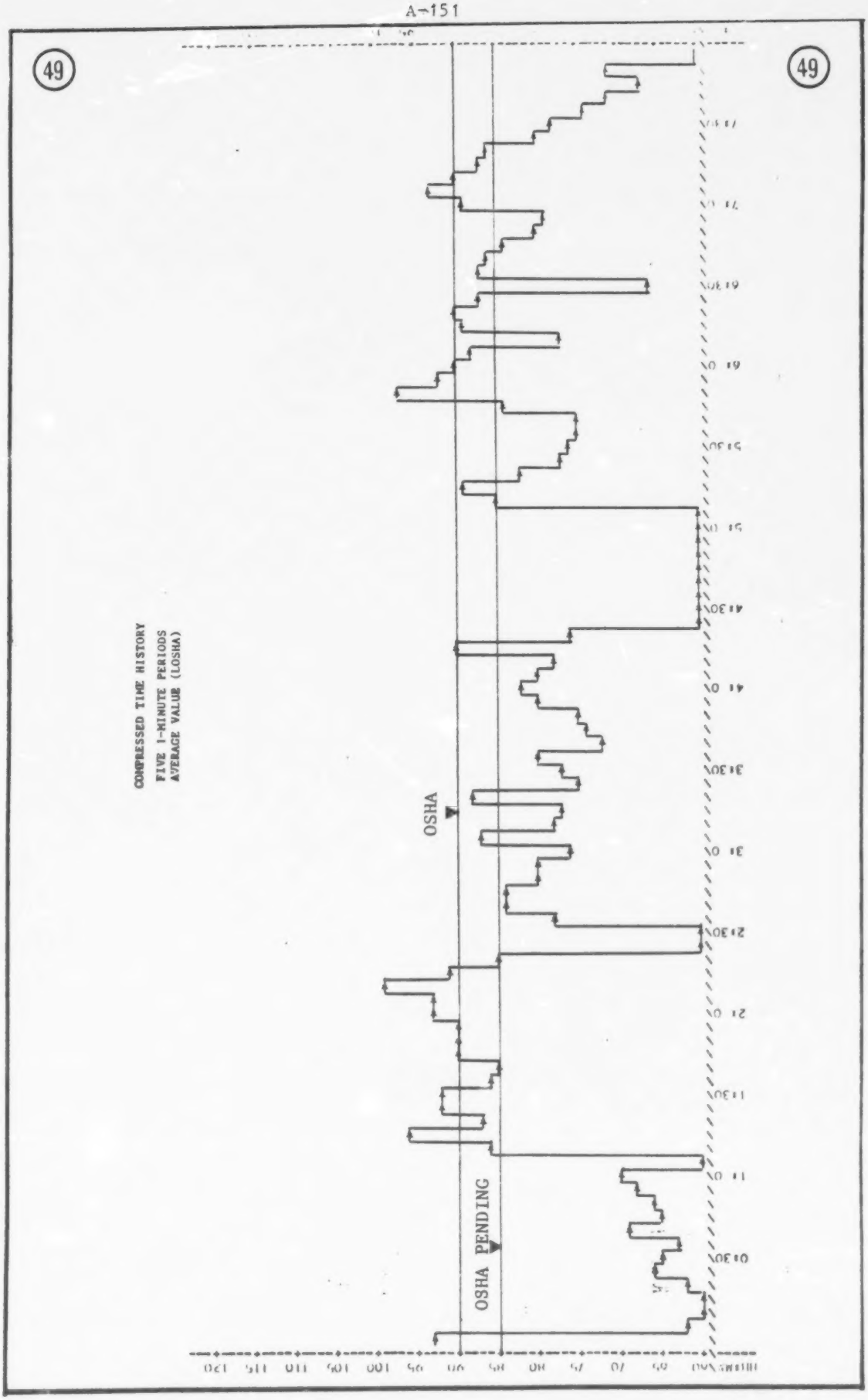
AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
135	28.1	60 TO 64
34	7.1	65 TO 69
39	8.1	70 TO 74
64	13.3	75 TO 79
60	12.5	80 TO 84
68	14.2	85 TO 89
57	11.9	90 TO 94
20	4.2	95 TO 99
3	.6	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




49
49
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

50

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

50

```
 1  26  80  1220    60    64     4     1
      69H     115200   480
 66  60  60  60  60  73  68  61  60  60  60  60  60  60  60  60
 90  97  80  62  63  81  97  96  97  96  98  95  98  98  85  97
 99  94  97  97  97  98  97  99  82  71  75  60  65  66  74  89
 89  88  96  94  95  86  89  91  91  90  90  90  93  93  93  90
 69  60  60  60  64  89  64  66  82  68  78  86  90  90  88  89
 88  88  85  72  67  72  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  61  66  89  85  85  84  85  87  84  82  78  82
 60  72  60  60  63  65  60  69  60  66  60  60  65  64  61  73
 60  76  67  84  87  87  90  87  70  81  82  78  68  73  80  81
 97  99  92  80  78  60  61  60  71  65  63  62  60  60  75  97
 97  89  95  96  72  60  60  60  60  60  60  60  62  76  79  85
 72  85  89  88  88  88  88  90  88  88  89  89  90  89  91  88
 89  90  90  87  88  89  88  88  87  89  87  86  76  82  60  60
 60  60  60  60  60  60  62  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  64  60  72  71  79  62  64  87  88  86
 84  85  84  85  85  84  85  85  85  84  85  85  87  89  91  90
 89  89  88  87  87  89  80  75  74  87  75  74  63  78  78  73
 75  71  71  72  66  68  63  60  66  60  61  63  65  63  77  85
 83  81  82  77  85  88  88  88  89  88  89  89  89  89  89  88
 88  88  87  87  86  77  77  80  83  80  66  65  60  60  60  60
 60  60  60  68  79  74  60  60  65  78  62  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 72  82  86  87  66  61  60  66  60  60  64  80  70  64  65  67
 73  79  78  66  62  60  60  63  62  64  67  62  72  63  61  60
 60  77  70  61  64  69  65  68  69  60  60  70  74  75  87  86
 83  66  60  61  60  61  79  94  95  87  78  68  60  71  75  74
 60  72  75  62  78  60  78  82  65  71  82  89  81  72  69  67
 64  67  60  72  60  67  63  71  60  65  68  60  72  66  67  60
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 27/08/79
ENTER SITE CODE (5 CHARS) : ISHAO
ENTER USER CODE (4 CHARS) : 4238
 ENTER JOB CODE (3 CHARS) : 018
```

```
   DATA LOGGED :27  AUG 1979
        LOGGER : DB-301/26
 SERIAL NUMBER : 1220
      BASELINE : 60 DB
 DYNAMIC RANGE : 84 DB
 SAMPLING RATE :  4/SEC
 TEST DURATION =    8  0  0

   DATA ANALYZED : 26 SEPT 1979
       SITE CODE : ISHAO
        JOB CODE : 018
       USER CODE : 4239
       THRESHOLD : 80 DB
 TOTAL SAMPLES = 115200
 STANDBY TIME =   0  2 54
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLED) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	91.0	91.0	14.383	14.38
2	82.6	88.0	4.466	18.85
3	83.7	86.8	5.211	24.06
4	83.1	86.0	4.824	28.88
5	83.4	85.6	5.038	33.92
6	76.9	84.7	2.028	35.95
7	70.8	83.8	.874	36.82
8	77.8	83.2	2.309	39.13

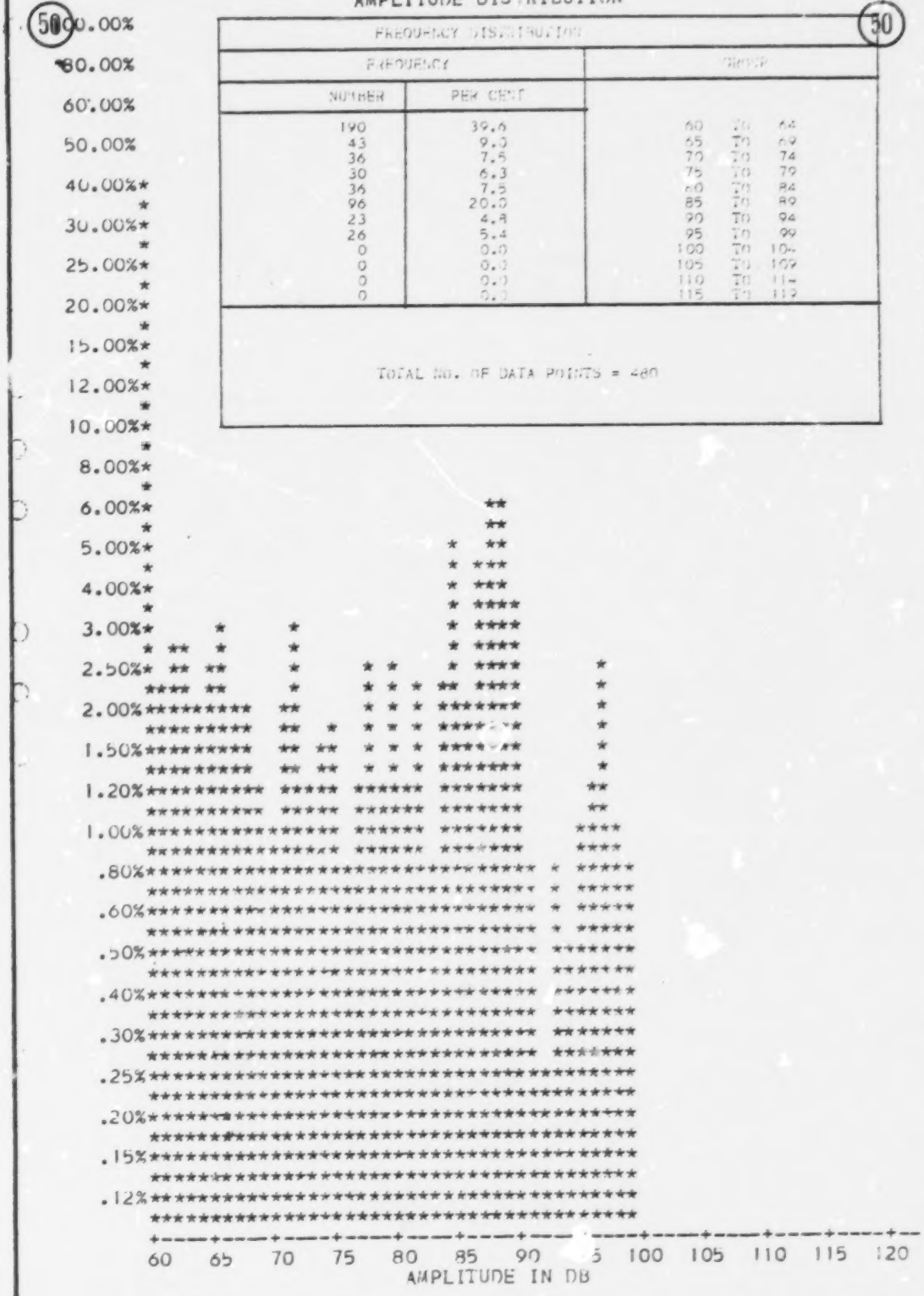
```
MIN. COMP. =  60 DB                MAX. COMP. =  90 DB
ARITHMETIC MEAN =  73 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```

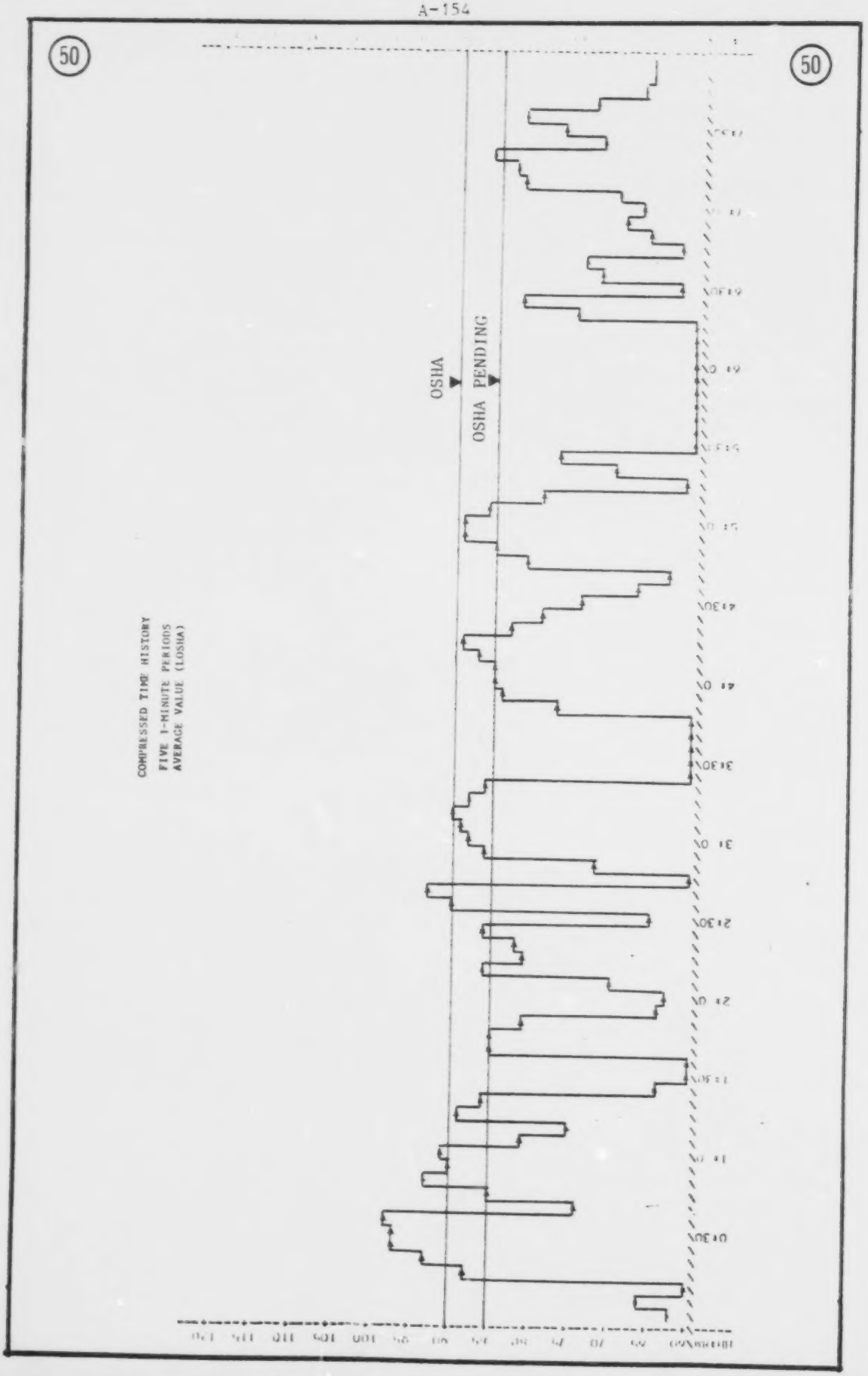
AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
190	39.6	60 TO 64
43	9.0	65 TO 69
36	7.5	70 TO 74
30	6.3	75 TO 79
36	7.5	80 TO 84
96	20.0	85 TO 89
23	4.8	90 TO 94
26	5.4	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




50
50
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(51)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  20  80  1225   60   64    4    1
      87     115200  480
   66  67  60  60  60  60  60  60  61  60  60  60  61  60  60  60
   60  77  62  64  76  65  61  60  60  60  64  60  60  65  64  73
   78  72  78  82  64  69  70  67  76  85  72  76  90  91  91  91
   91  91  91  90  91  92  93  89  90  92  92  91  93  91  91  92
   92  91  91  91  92  93  92  92  91  96  97 101 101 101  96 101
  100  97 101 100  97  91  96  89  92  94  93 101  96 104 101 105
  109 107 103 105 103  98  90  81  85  85  81  81  80  82  91  80
   80  86  77  74  70  73  76  80  76 102 104 103 104 107 106 102
  103  91  92  94  93  93  93  93  92  92  90  89  90  89  89  90
   91  92  92  92  92  91  90  90  91  90  90  91  91  93  93  90
   95  95  90  89  88  89  86  88  88  88  90  90  89  89  89  89
   89  89  89  89  89  89  89  90  90  90  99  89  89  90  91  94
   95  97 101 102 102 104 103  96  94  96  94  94  96  97  96  94
   92  91  92 100 102  97  89  89  99  96  92  86  86  86  89  90
   92  94  93  92  94  95  93  94  98  99 100  99  93  93  94  96
  100 102  99  95  92  91  90  92  92  97  98  92  90  92  93  94
   98  97  93  93  96  95  95  96  96  97  98  94  94  92  94  93
   94  95  96  97  97  96  95  97  97  96  96  97  94  97  98  94
  102  98  90 101 103  97  80  76  75  63  60  80  80  65  79  80
   74  80  80  83  84  85  75  80  80  80  84  80  80  80  80  80
   80  80  80  80  82  90  94  86  82  76  71  81  76  89  88  82
   78  90  74 100 100  87  97  97  93  86  89  96 102 105 105  97
   96  92  89  96 104 103 101  96  89  89  90  90  90  96  99 102
   94  92  91  92  91  91  91  93  99  93  98  95  98  90  91  93
   94  92  92  94  92  90  91  90  90  91  91  91  92  92  91  91
   94  96  94  96  97  96  97  97  96  96  96  96  96  97 100  98
   91  90  92  96  93  91  92  92  92  92  92  92  91  88  88  89
   88  89  88  88  89  93  98  98 101 103 104 103 103 103  99  76
   61  60  60  60  60  60  60  60  60  60  60  60  75  90  89  89
   88  90  96  93  93  93  92  94  94  84  71  66  62  65  66  64
%EOF
```

(51)

```
ENTER LOG DATE (DD/MM/YR) : 23/07/79
ENTER SITE CODE (5 CHARS) : CC203

ENTER USER CODE (4 CHARS) : 2839
 ENTER JOB CODE (3 CHARS) : 080
```

```
    DATA LOGGED :23 JULY 1979          DATA ANALYZED : 17 SEPT 1979
        LOGGER : 08-301/26                SITE CODE : CC203
 SERIAL NUMBER : 1225                      JOB CODE : 080
      BASELINE : 60 DB                    USER CODE : 2839
 DYNAMIC RANGE : 64 DB                   THRESHOLD : 60 DB
 SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
 TEST DURATION =  8 HR 0 M             STANDBY TIME =  0 HRS
```

TIME HISTORY ANALYSIS

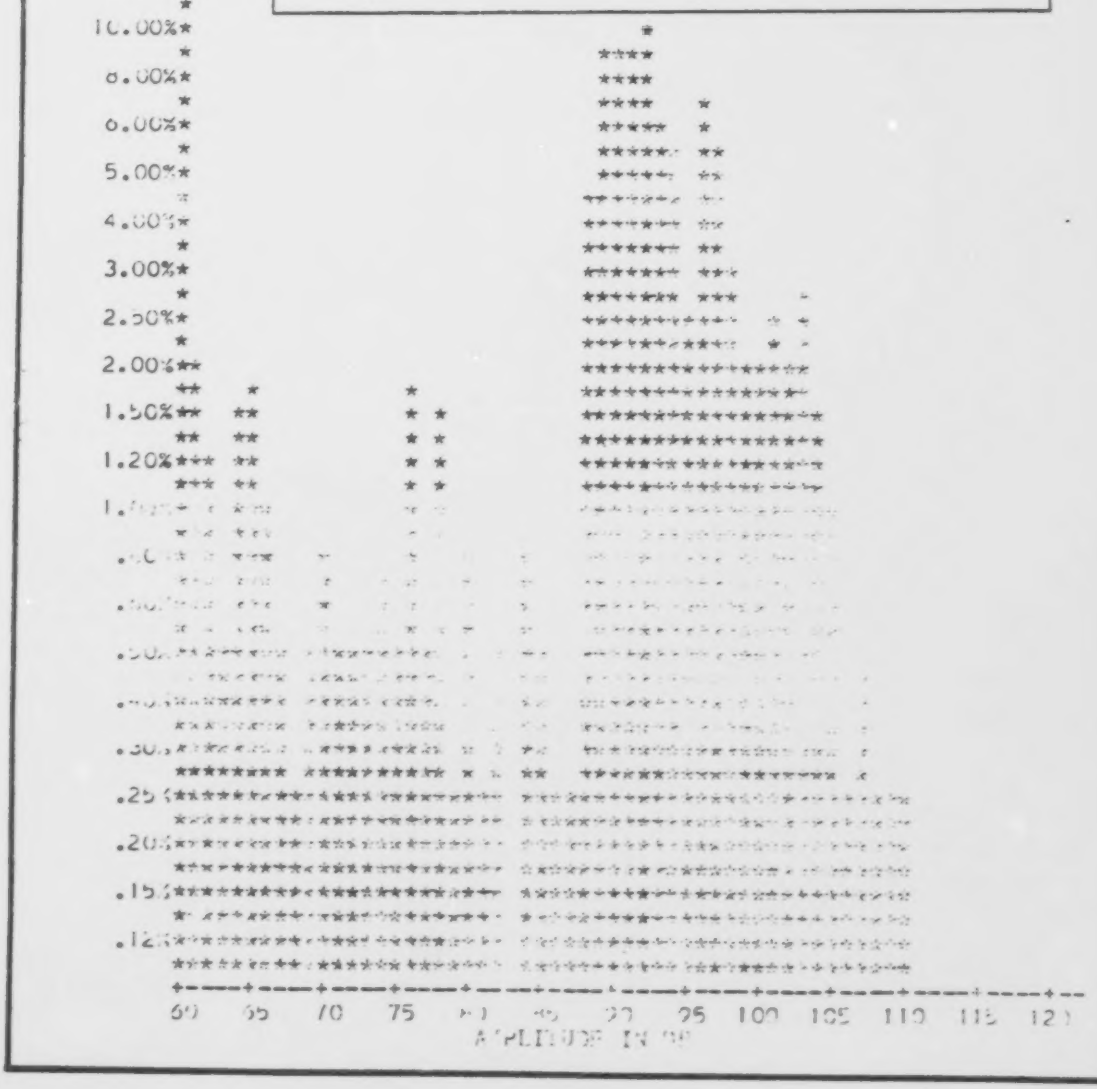
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

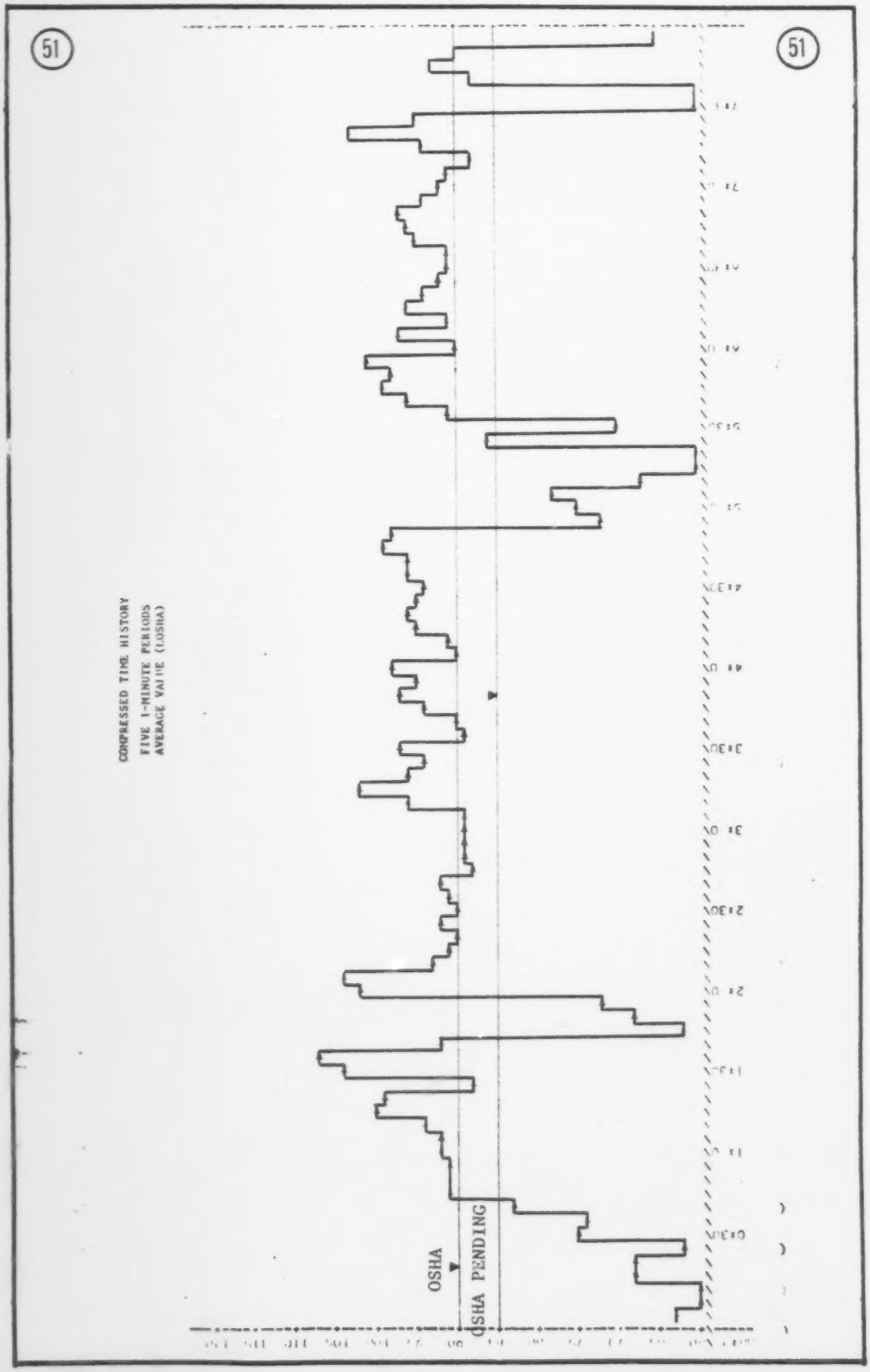
TIME	LOCAL		NOISE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	82.6	82.6	4.450	4.45
2	96.5	92.8	32.237	36.69
3	94.8	93.5	24.150	60.84
4	95.3	94.0	26.131	86.97
5	95.2	94.3	25.813	112.79
6	91.6	93.8	15.989	128.79
7	94.3	94.0	22.542	151.33
8	92.3	93.8	17.148	168.47

MIN. COMP. = 60 DB MAX. COMP. = 113 DB
ARITHMETIC MEAN = 90 DB
STD. DEVIATION = 13 DB
VARIANCE =169 DB

51

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
71	14.8	60 TO 64
16	3.3	65 TO 69
12	2.5	70 TO 74
18	3.8	75 TO 79
9	1.9	80 TO 84
58	12.1	85 TO 89
162	33.8	90 TO 94
81	16.9	95 TO 99
43	9.0	100 TO 104
9	1.9	105 TO 109
1	.2	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




51
51
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(52)

PLACE TAPE IN READER WITH TYPE A CARRIER AND A RECORDER

```
 1  26  80  121M   60   64    4    1
    23      115200  480
 63  60  60  65  60  60  62  61  60  60  61  60  60  60  61  61
 60  60  60  66  60  60  60  60  62  60  60  63  64  74  72  68
 79  85  88  88  89  88  88  88  88  89  88  88  88  88  88  88
 86  88  39  88  89  89  90  89  89  89  90  89  89  90  89  89
 89  89  89  90  89  89  89  95  97 100 102 100  98 102 100  99
102 103  98  97  94  89  93  92  92  92  97  96  95  95  95  95
 95  97  98  90  90  90  90  90  90  90  90  90  90  90  90  90
 90  90  91  92  93  90  90  95  93  95  95  97  96  94  92  95
 88  86  88  88  92  91  92  91  90  88  88  87  86  89  89  89
 94  89  89  89  89  88  88  87  88  88  88  91  88  93  93  93
 91  89  90  90  89  89  90  89  89  89  90  90  90  92  89  89
 89  89  90  89  89  89  89  89  89  90  90  90  91  92  97  95
102 102 100 103 102 102 103 103  96  97  99  99  94  90  94  88
 95 101  97  92  85  84  87  87  89  85  82  83  83  84  83  85
 85  86  85  86  85  94  94  95  95  93  92  93  93  95  96  98
 97  97  98  97  97  95  91  92  94  92  88  88  88  87  82  82
 84  84  84  86  87  82  82  82  82  82  82  81  80  90  90  90
 99 100  99  97  98  97  98  98  99  98  98  99  99  98 104  93
 94 101 102  88  72  74  84  60  60  60  60  60  75  75  64  60
 60  77  74  80  67  60  60  60  60  60  60  60  60  60  60  60
 60  60  61  73  67  60  60  58  57  60  74  66  77  70  61  67
 84 101  96  89  97  94  89  86  90  96 102 100  99  91  95  87
 91  99 101 101  98  90  86  86  86  86  88  93  99  98  91  90
 89  90  89  89  90  95  94  92  96  93  92  86  87  83  89  88
 89  89  87  87  87  87  87  87  87  89  89  90  90  90  92  91
 90  92  90  90  90  90  90  90  90  90  90  91  93  92  96  88
 89  90  89  87  88  87  87  87  87  87  86  86  86  86  86  86
 86  86  86  93  94  95 101 100 101  94  98  97  90  91  90  90
 90  91  90  90  90  90  90  90  90  92  77  89  88  98  84  92
 97  92  94  95  94  96  87  85  81  80  80  80  80  83  80  80
%EOF
```

ENTER LOG DATE (DD/MM/YR) : 23/07/79
ENTER SITE CODE (5 CHARS) : CO203
ENTER USER CODE (4 CHARS) : 4703

ENTER JOB CODE (3 CHARS) : 272

DATA LOGGED :23 JULY 1979
LOCATION : M-301/25
SERIAL NUMBER : 121
INSTRUMENT : 50 DB
DYNAMIC RANGE : 94 DB
SAMPLING RATE : 9765
TEST DURATION = 24 HOURS

DATA ANALYZED : 17 SEPT 1979
SITE CODE : CO203
JOB CODE : 272
USER CODE : 4703
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STANDBY TI = 0 HOURS

TIME HISTORY ANALYSIS

DATA HANDLING INDEX (D.H.I.) CALCULATIONS
ARE BASED ON THE HOURLY LEQ:
LEQ (24) = 80.04 DB
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 HOURS

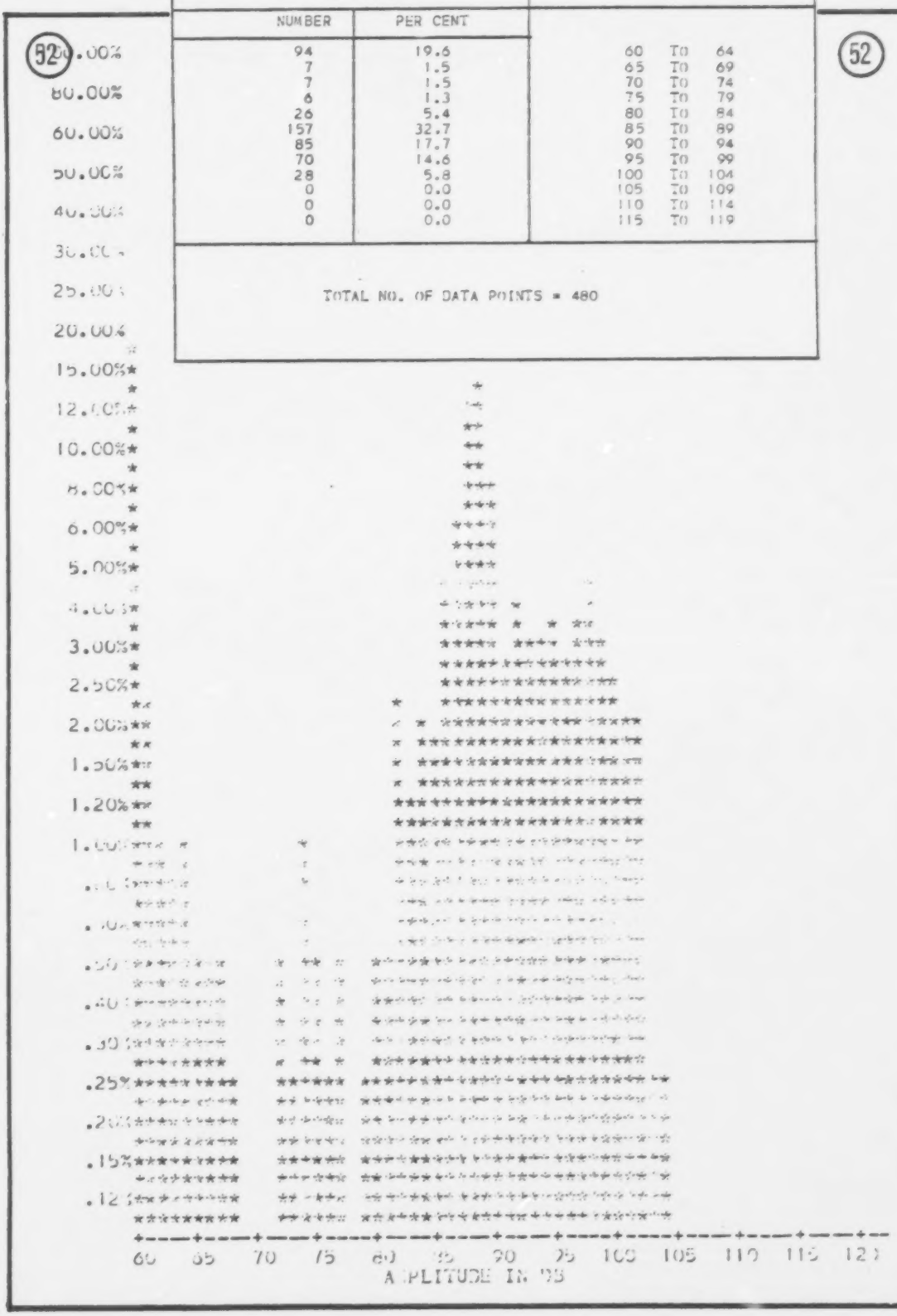
TIME	LEQ'S		SOUND	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	83.0	83.0	4.728	4.73
2	92.3	89.1	17.378	22.02
3	90.2	89.5	12.177	34.92
4	94.4	91.1	22.934	57.89
5	94.0	91.7	21.742	79.80
6	92.0	91.9	12.191	91.79
7	90.5	91.3	13.363	105.11
8	87.3	91.1	11.413	116.53

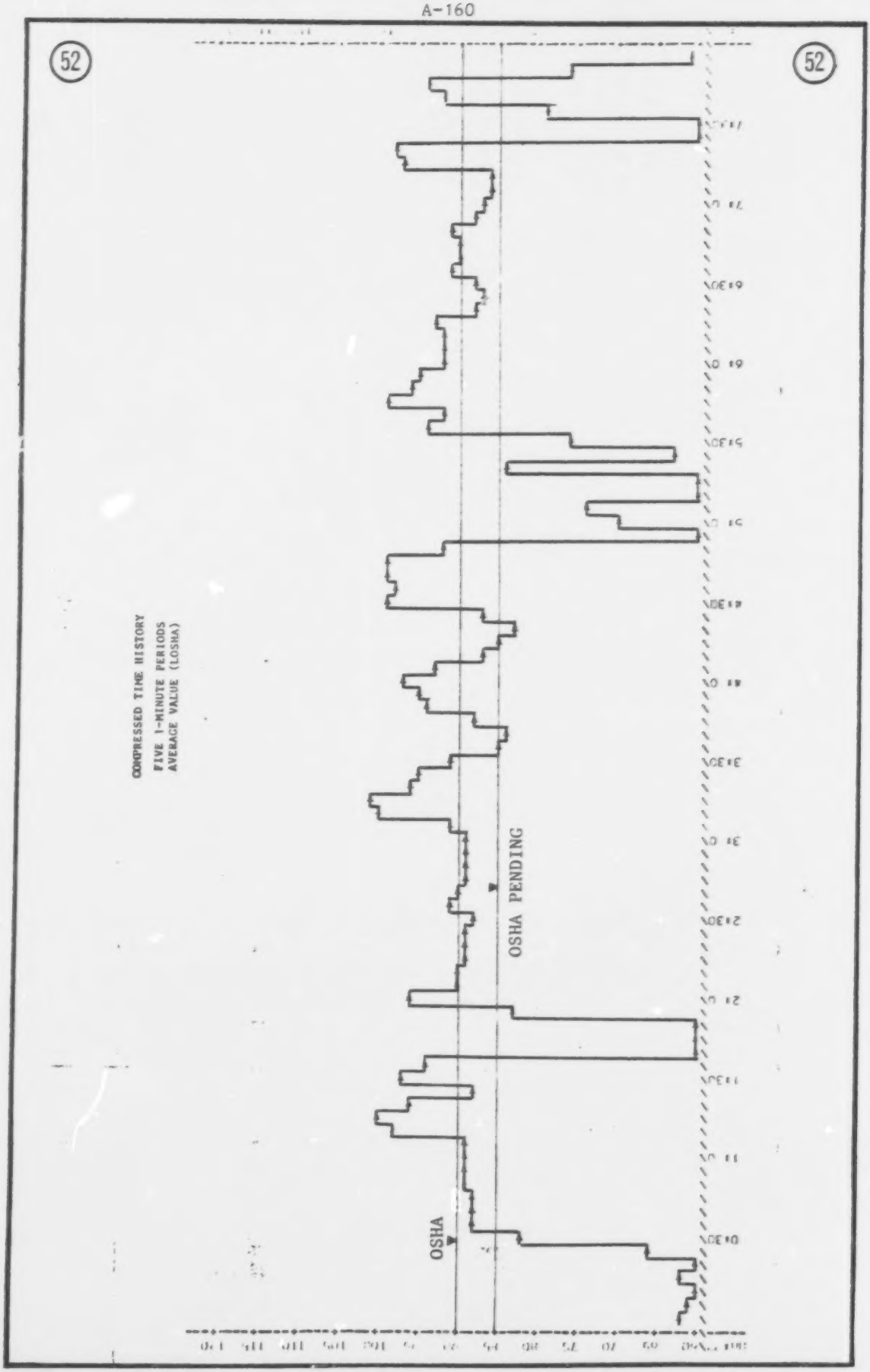
MIN. COMP. = 80 DB
ARITHMETIC MEAN = 94 DB
STD. DEVIATION = 15 DB
VARIANCE =197 DB
MAX. COMP. = 101 DB

(52)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
94	19.6	60 TO 64
7	1.5	65 TO 69
7	1.5	70 TO 74
6	1.3	75 TO 79
26	5.4	80 TO 84
157	32.7	85 TO 89
85	17.7	90 TO 94
70	14.6	95 TO 99
28	5.8	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

(52)




52
52
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA PENDING
OSHA

(53)

PLACE (ANY IN HEADER LINE) TYPE A "SPACE" AND A "RETURN"
1 26 80 1210 60 64 4 1
336 1152 480
60 64 60 61 60 67 68 64 68 75 79 83 76 76 96 100
100 100 103 103 103 98 94 97 93 99 100 98 96 96 95 9[illegible]
99 98 99 99 94 99 96 93 [illegible] 91 60 60 60 60 60 60
60 62 60 67 62 65 [illegible] [illegible] [illegible] 90 [illegible] 63 60 60 60
60 68 60 60 70 65 60 60 60 60 60 66 63 60 64 60
[illegible]
[illegible]
[illegible]
60 60 60 70 64 60 61 60 60 60 60 64 60 61 60
[illegible]
[illegible]
78 79 81 78 74 80 81 82 84 85 87 84 80 81 83 [illegible]
[illegible]
[illegible]
98 97 97 93 93 88 98 93 91 91 90 95 98 94 96 92
[illegible]
61 61 70 70 65 70 62 60 60 60 60 60 64 62 [illegible] 60
60 60 62 60 67 61 63 60 60 60 60 65 64 60 60 60
71 84 96 94 93 99 92 93 91 74 [illegible] 73 [illegible] 92 95 94
99 95 90 84 85 83 86 95 [illegible] 89 87 95 84 85 90 92
[illegible]
92 93 103 106 106 84 67 69 79 83 94 96 97 95 95 94
85 68 72 68 71 64 71 65 66 88 94 96 95 99 95 90
93 98 90 89 79 79 81 83 82 85 88 90 86 80 88 89
66 86 99 109 109 109 109 107 86 104 103 106 98 [illegible] 94 90
91 85 74 90 90 92 92 81 76 90 91 89 86 90 92 94 97
96 96 94 94 75 76 66 60 62 60 61 60 [illegible] 60 60 60
63 89 92 94 99 87 60 65 61 60 67 64 61 62 67 61
60 60 73 62 72 92 91 91 91 92 94 91 93 92 96 97
96 97 98 100 100 99 100 98 98 90 78 79 79 88 85 81
/EOF

(53)

ENTER LOG DATE (DD/MM/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC2C2
ENTER USER CODE (4 CHARS) : 2779

ENTER JOB CODE (3 CHARS) : 220

DATA LOGGED :12 JULY 1979
L[illegible] = -30[illegible]
[illegible] = [illegible]
LABEL[illegible] = [illegible]
[illegible] = [illegible]
[illegible] = [illegible]

DATA ANALYZED : 16 SEPT 1979
[illegible] = [illegible]
[illegible] = [illegible]
USER CODE = 2779
[illegible] = [illegible]
[illegible] = [illegible]
[illegible] = [illegible]

TIME HISTORY ANALYSIS

[illegible] DATA (C.I.) CALCULATIONS
[illegible]
[illegible] = [illegible]
[illegible] = [illegible]
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
[illegible] = [illegible]

HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	93.1	93.1	19.131	12.13
2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	4.117	24.12
4	93.7	89.3	20.976	45.09
5	79.9	88.1	3.093	47.18
6	[illegible]	[illegible]	[illegible]	[illegible]
7	97.3	92.7	34.515	127.5[illegible]
8	[illegible]	92.4	12.1[illegible]	139.77

[illegible] = 60 DB
ARITHMETIC [illegible] = [illegible]
[illegible] = [illegible]
VARIANCE = [illegible]

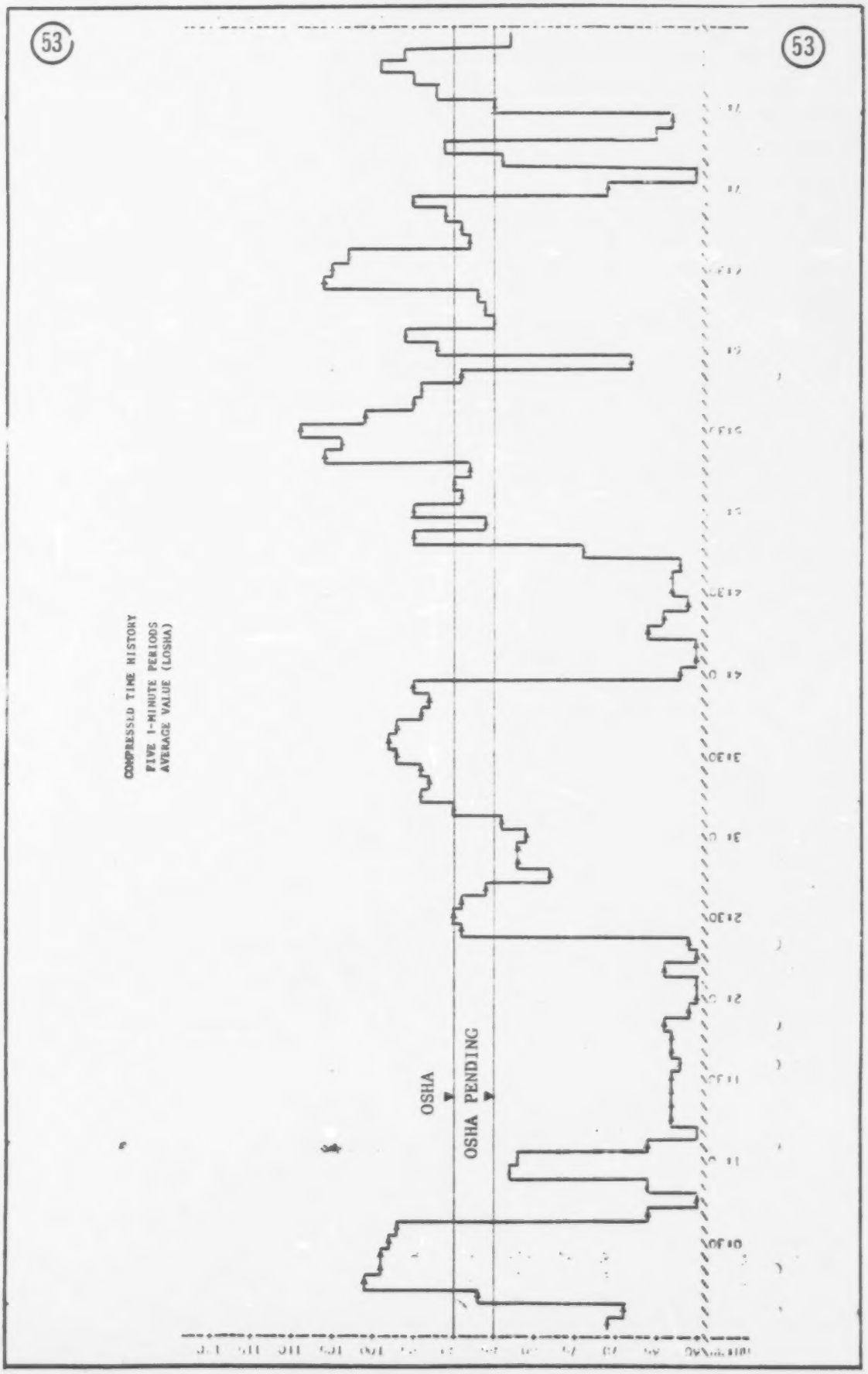
[illegible] = 111 DB

58

AMPLITUDE DISTRIBUTION

53

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
149	31.0	60 TO 64
34	7.1	65 TO 69
19	4.0	70 TO 74
22	4.6	75 TO 79
35	7.3	80 TO 84
40	8.3	85 TO 89
75	15.6	90 TO 94
70	14.6	95 TO 99
18	3.8	100 TO 104
14	2.9	105 TO 109
4	.8	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


53
53
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(54)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1224   60   64    4    1
      35     115200  480
  66  64  63  71  69  72  82  70  68  69  65  68  73  74  65  68
  67  70  65  63  60  61  69  71  71  65  66  60  69  64  60  60
  60  67  60  60  63  71  70  64  73  84  90  88  91  60  76  83
  86  98  90  97  90  87  89  95  82  89  96  89 100 101 100  84
  82  82  72  84  68  90  99  92 100 100 101 102 101 101 102 102
 100 101 102 102 102  98 102  99  85  96 101 101 102 100  99 101
 101 100 102  99  99  97  99 100 100 100  95  87  80  81  82  80
  80  80  79 100 100 102 100 103 102 102 102 116 104 102  96  95
  92  91  92  96 103 107 105  63  60  65  60  60  60  72  60  60
  81  84  89  93 102  97  71  76  60  60  60  60  60  60  63  60
  74  81  80  72  79  82  80  80  80  80  67  84  84  88  70  80
  67  98 101  95 102  95  95  95  97  96  96  96  95  95  95  95
  96  94  94  93  93  93  93  93  94  94  97  91  91  91  91  91
  91  91  91  90  90  90  90  91  90  91  91  91  90  90  90  90
  90  90  90  91  91  92  90  91  91  91  90  92  91  91  91  91
  94  92  92  91  94  92  92  92  92  92  92  91  97  79  87  80
  60  91 104  97 101 106  98  96 101 106 100 105 108 109 108 106
 108 109  95  95  96 104 103  99 101 102  99 101  98  99 101 103
 101 107 101  92 101 101  85  80  80  65  80  84  80  84  80  82
  86  79  87  80  87  74  74  65  78  80  80  80  81  92  98  83
  73  77  98 102 105  97 105 105  93  75 105 104 108 107 107 107
 107 108 109 112 110 106 109 107 106  84  89  83  91  95  98  97
  92  86  89  89  90  92 102  97  91  88  82  66  78  93 110 108
 111 111 112 110 110 109 111 111 111 111 111 112 112 111 103 102
  90  98  97  82  94  81  95  98  97  97  91  94  93  89  95  85
  70  74  84  69  96  77  62  86  95  80  68  71  87  97 101 100
 104 109 111 105  91  90  90 106 107 106  79  87  90  90  86  86
  89  83  85  84  90  62  80  80  80  79 101  89  87  87  82  70
  78  91  85  91  86  86  85  87  80  80  66  95 108 101  97 105
 109 107 109 113 108 115 112 108 102 102 102 102 102 101 100  84
%EOF


ENTER LOG DATE (DD/MM/YR) : 26/07/79
ENTER SITE CODE (5 CHARS) : 2SHAF

ENTER USER CODE (4 CHARS) : 2506
 ENTER JOB CODE (3 CHARS) : 220


   DATA LOGGED :26 JULY 1979
        LOGGER : 08-301/26
SERIAL NUMBER : 1224
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8: 0: 0

DATA ANALYZED : 19 SEPT 1979
    SITE CODE : 2SHAF
     JOB CODE : 220
    USER CODE : 2506
    THRESHOLD :  80 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =   0: 0: 8

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                    DOSE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1        82.3        82.3        4.297        4.30
   2        98.2        94.0       39.145       43.44
   3        95.1        94.4       25.394       68.84
   4        92.8        94.0       18.552       87.39
   5       100.0        95.7       50.098      137.49
   6       100.1        96.6       51.004      188.49
   7       103.5        98.1       81.690      270.18
   8       100.5        98.5       53.527      323.71
MIN. COMP. =  60 DB              MAX. COMP. = 116 DB
ARITHMETIC MEAN =  86 DB
STD. DEVIATION =  15 DB
VARIANCE =225 DB
```

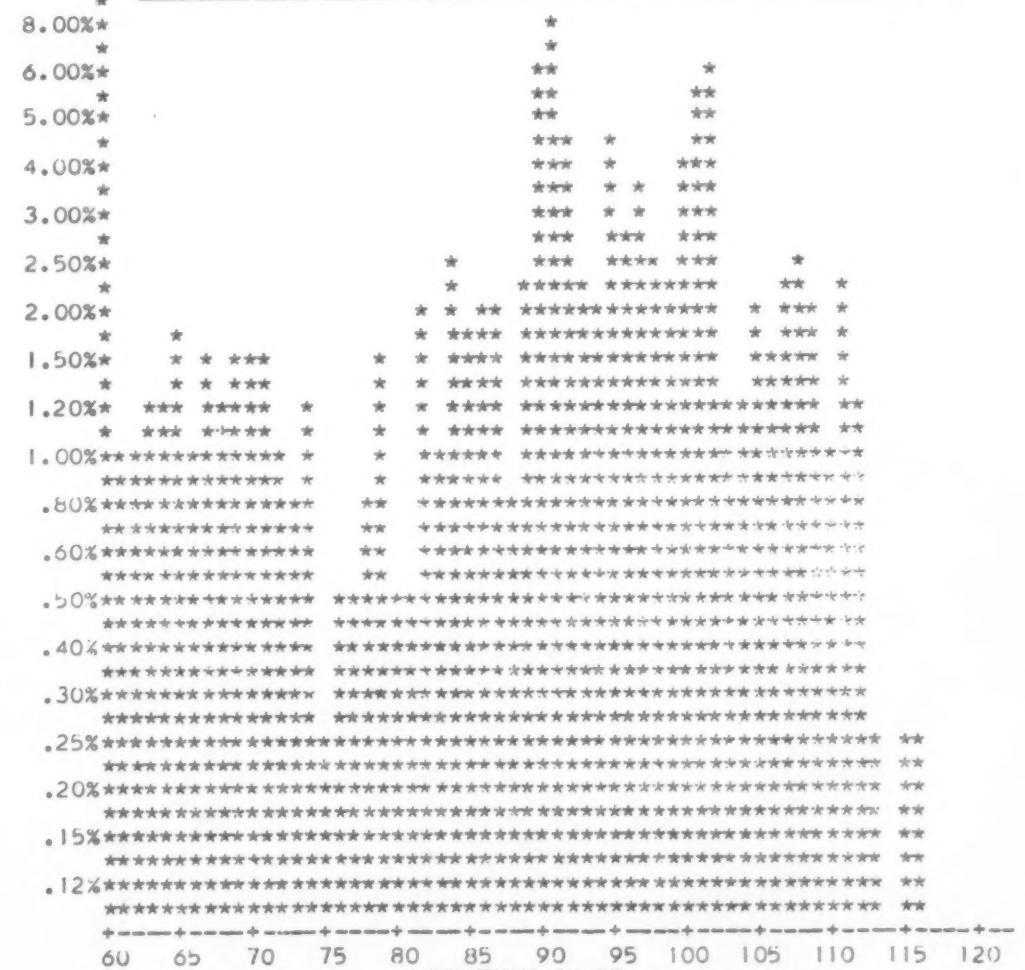
(54)

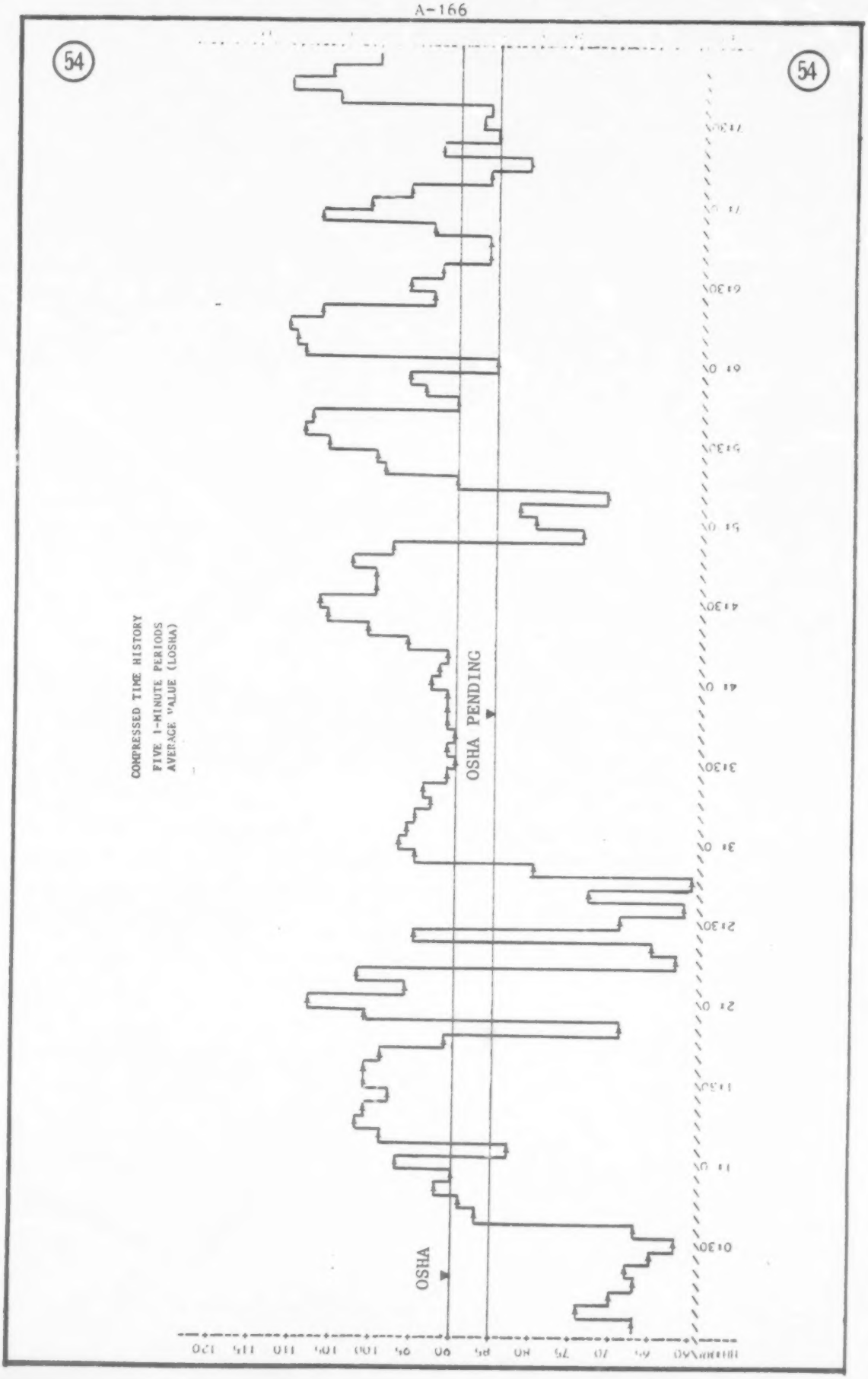
AMPLITUDE DISTRIBUTION

(54) (54)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
64	13.3	60 TO 64
28	5.8	65 TO 69
24	5.0	70 TO 74
14	2.9	75 TO 79
26	5.4	80 TO 84
35	7.3	85 TO 89
91	19.0	90 TO 94
62	12.9	95 TO 99
74	15.4	100 TO 104
41	8.5	105 TO 109
19	4.0	110 TO 114
2	.4	115 TO 119

TOTAL NO. OF DATA POINTS = 480




54
54
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA PENDING
OSHA
0130
1
1130
2
2130
3
3130
4
4130
5
5130
6
6130
7
7130
INHIBIT %40 45 70 75 80 85 90 95 100 105 110 115 120

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  20  80  1212    60    64     4     1
        30      115200   480
   60  60  60  62  65  60  64  66  74  78  71  60  60  61  60  60
   60  60  61  60  64  70  72  64  63  69  73  70  70  71  63  72
   65  72  64  69  64  66  60  66  71  61  61  60  61  62  73  70
   65  78  79  69  62  61  65  71  67  64  64  62  61  63  60  63
   60  61  61  60  73  60  65  67  66  74  71  81  85  82  75  74
   85  83  79  89  85  85  89  90  86  92  82  91  93  89  92  89
   87  87  87  85  87  87  91  91  87  86  90  90  [illegible]  86
   87  84  83  84  87  85  84  90  88  97  94  83  82  74  88  87
  103 103  99  94 100  93  76  87  89  90  92  92  92  92  88  88
   92  91  92  91  91  89  87  91  90  90  85  87  84  80  70  83
   66  73  71  60  80  80  80  72  74  77  78  66  78  79  76  71
   73  75  85  94  78  83  85  86  83  76  77  78  75  77  78  78
   81  92  92  91  88  79  77  89  85  85  87  89  88  91  94  94
   90  87  86  88  82  80  84  89  92  92  90  90  86  90  91  86
   77  74  87  89  92  88  87  90  90  97  97  96  96  93 100  91
   92  94  98  92 100  97  90  91 103  96 100  93  87  87  73  71
   80  80  88  85  89  75  89  81  82  79  91  90  90  90  90  89
   88  88  85  81  80  80  80  80  80  80  80  80  82  80  80  80
   80  80  82  89  88  91  87  92  89  88  73  83  75  80  80  80
   80  80  71  85  80  81  71  76  73  74  81  87  88  86  85  86
   88  90  90  82  80  80  80  80  80  80  80  80  80  80  80  80
   80  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80
   80  80  80  80  80  78  80  80  80  80  87  80  75  80  86  89
   94 102  98  97  92  92  90  90  96  86  84  87  89  90  94  91
   86  87  88  90  89  90  90  91  87  91  89  90  88  90  94  94
   93  92  86  93  91  92  88  91  91  92  93  89  88  87  87  88
   91  94  87  89  86  84  84  90  86  85  86  87  86  86  87  86
   88  90  91 100  99  91  93 102  95  98  99  94  76  80  87  86
   80  70  80  81  83  81  71  86  86  87  81  83  88  84  84  81
   84  88  81  84  83  84  84  86  82  80  87  83  82  80  82  72
%EOF


ENTER LOG DATE (DD/MM/YR) : 11/09/79
ENTER SITE CODE (5 CHARS) : 2SHAF

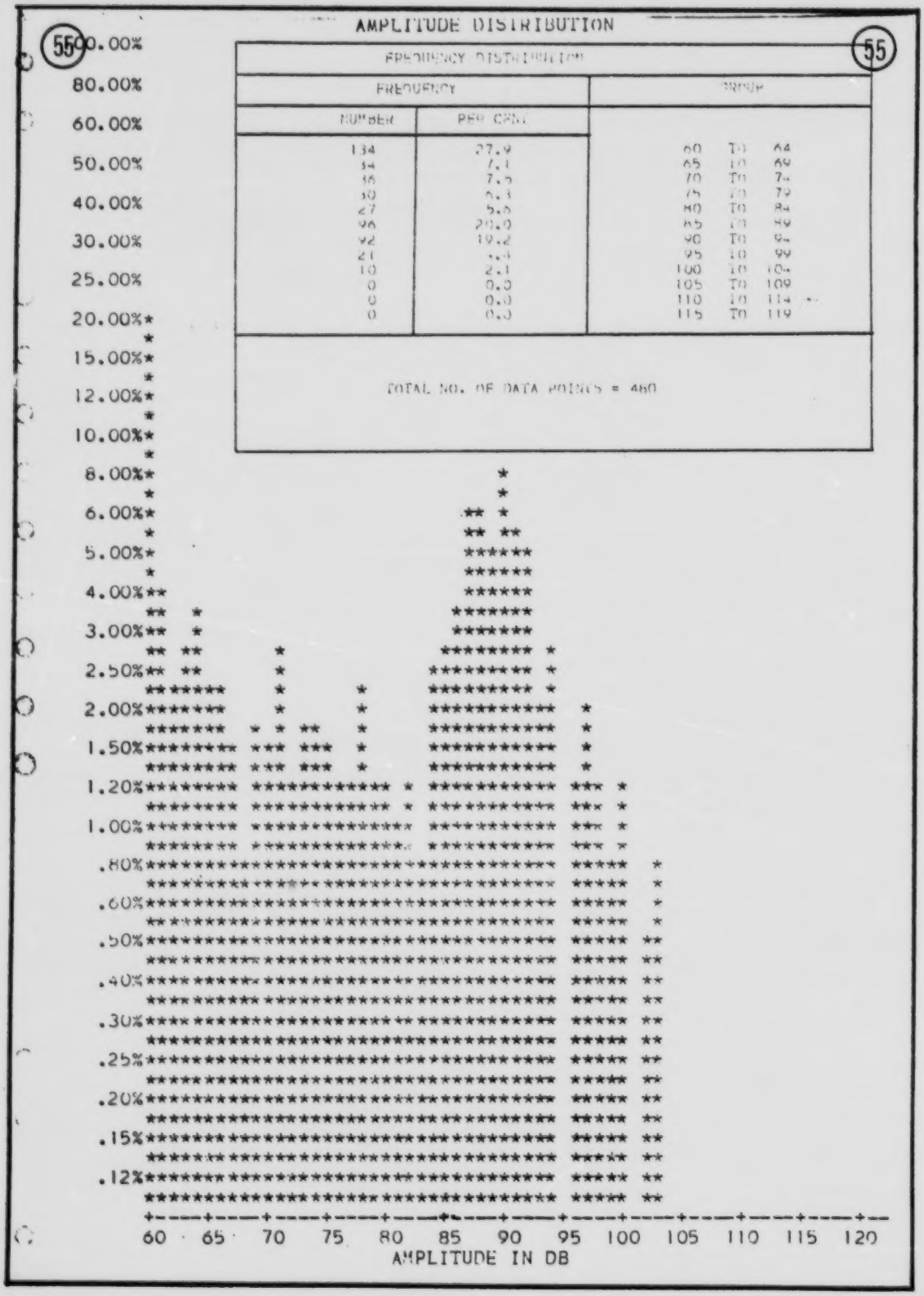
ENTER USER CODE (4 CHARS) : 4140
 ENTER JOB CODE (3 CHARS) : 141

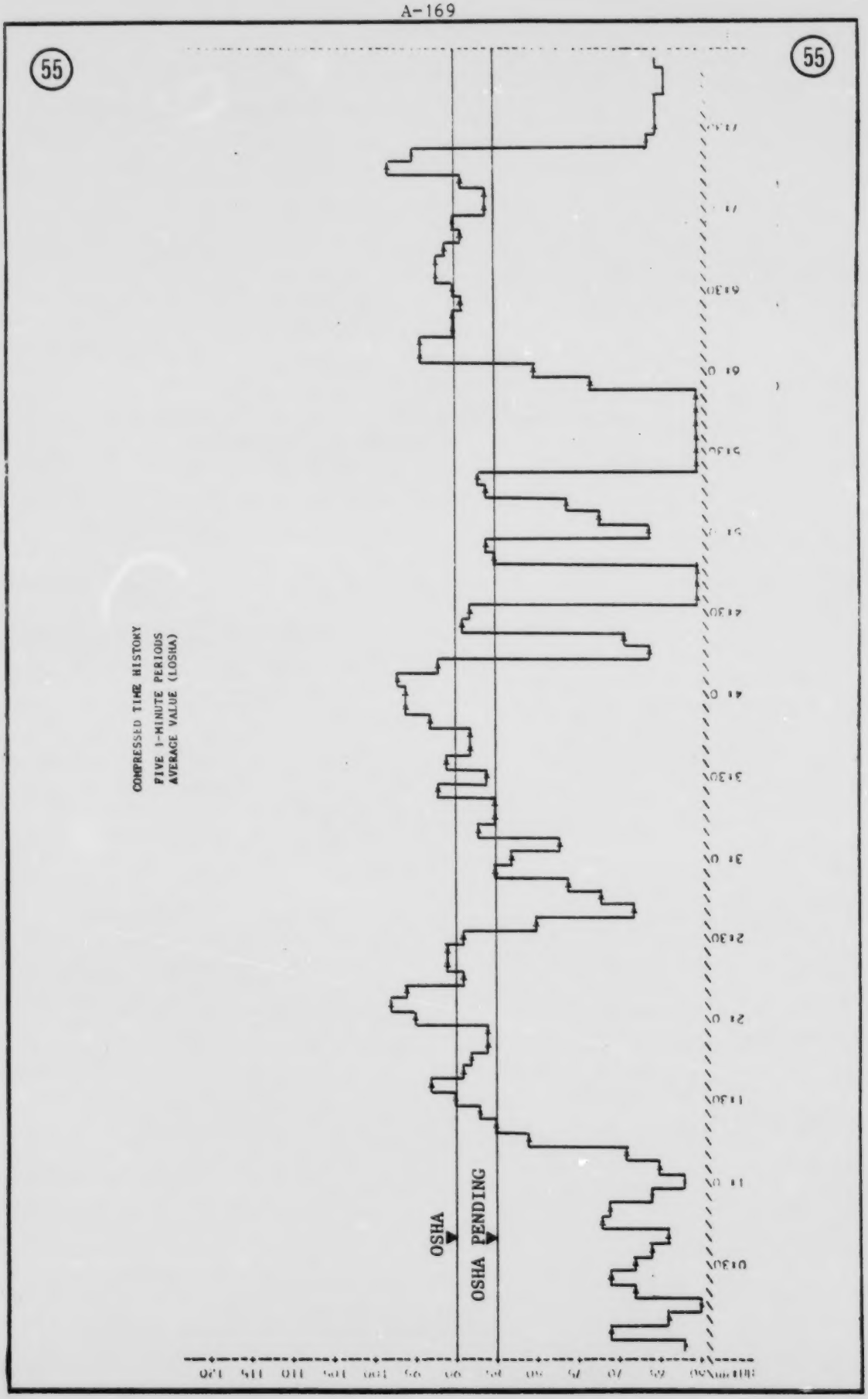

   DATA LOGGED :11 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
        LOGGER : DS-301/26                 SITE CODE : 2SHAF
 SERIAL NUMBER : 1212                       JOB CODE : 141
      CASSETTE : 80 DB                     USER CODE : 4140
  DYNAMIC RANGE : 48 DB                    PASSWORD : [illegible]
 SAMPLING RATE : 4/SEC                  TOTAL SAMPLE =  115200
 TEST DURATION =  [illegible]           SAMPLE SIZE =  [illegible]


              TIME HISTORY ANALYSIS

 [illegible] EXPOSURE LEVEL (D.E.L.) CALCULATIONS
 [illegible]
 [illegible]
 [illegible]
 [illegible]
   NUMBER OF COMPILATIONS = 480
PERIOD =  1 MINUTES

TIME          DOSE                        DOSE
HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1        67.6        67.6         .572         .57
   2        86.0        81.6        7.181        7.75
   3        90.2        [illegible]  12.743       20.43
   4        89.0        [illegible]  10.933       31.37
   5        88.1        87.0         9.613        41.05
   6        [illegible] 86.0         1.754        42.84
   7        90.8        [illegible]  13.870       56.71
   8        [illegible] [illegible]  [illegible] [illegible]
MIN. CORR. =  80 DB                 MAX. CORR. = 103 DB
ARITHMETIC MEAN =  77 DB
STD. DEVIATION =  13 [illegible]
VARIANCE =167 DB
```


AMPLITUDE DISTRIBUTION
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
134 27.9 60 TO 64
34 7.1 65 TO 69
36 7.5 70 TO 74
30 6.3 75 TO 79
27 5.6 80 TO 84
96 20.0 85 TO 89
92 19.2 90 TO 94
21 4.4 95 TO 99
10 2.1 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


55
55
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(56)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(56)

1 26 80 1225 60 64 4 1
123 115200 480

61	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	61	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	61	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	67	60	60	60	60	60	62	60	65	62	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
74	60	60	60	62	64	61	71	60	68	62	60	71	64	61	60
60	60	60	60	60	60	60	60	60	60	60	60	75	60	60	65
86	64	66	64	63	60	60	60	60	64	80	87	70	70	60	60
62	60	60	60	60	60	69	80	72	75	60	65	60	60	60	60
65	69	63	67	69	71	64	69	62	69	70	69	68	69	66	75
82	77	73	79	81	83	77	78	63	60	60	60	60	60	61	65
60	60	63	62	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	65	77	69	60	60	60	60	75	72	78	71	68	64	67
71	64	60	62	62	61	61	63	66	75	70	72	75	66	75	77
75	77	72	74	74	66	67	65	65	69	72	65	67	62	61	60
61	60	67	78	74	77	72	70	72	77	72	71	74	77	71	73
73	76	78	75	73	70	69	64	66	65	68	69	64	60	60	60
67	60	60	60	62	62	60	60	60	60	60	60	60	60	60	60
60	60	60	60	73	61	60	60	60	60	60	60	60	60	60	60
60	60	87	63	60	60	60	60	60	60	60	60	60	73	70	61

%EOF

ENTER LOG DATE (DD/MM/YR) : 28/08/79
ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 7450
ENTER JOB CODE (3 CHARS) : 294

DATA LOGGED :28 AUG 1979
LOGGER : DB-301/24
SERIAL NUMBER : 1225
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 48 HR 0 MIN

DATA ANALYZED : 26 SEPT 1979
SITE CODE : ISHAF
JOB CODE : 294
USER CODE : 7450
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STARTING TIME = 08 HR 00 MIN

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL DOSE = 30.00 / 2 DAYS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME HOUR	LOCAL CURRENT	LOCAL CUMULATIVE	NOISE CURRENT	NOISE CUMULATIVE
1	60.0	60.0	.196	.20
2	60.0	60.0	.196	.39
3	60.0	60.0	.195	.59
4	62.3	61.7	.269	.86
5	70.4	63.9	.825	1.68
6	68.6	64.9	.642	2.32
7	71.5	66.3	.961	3.29
8	65.9	66.3	.444	3.73

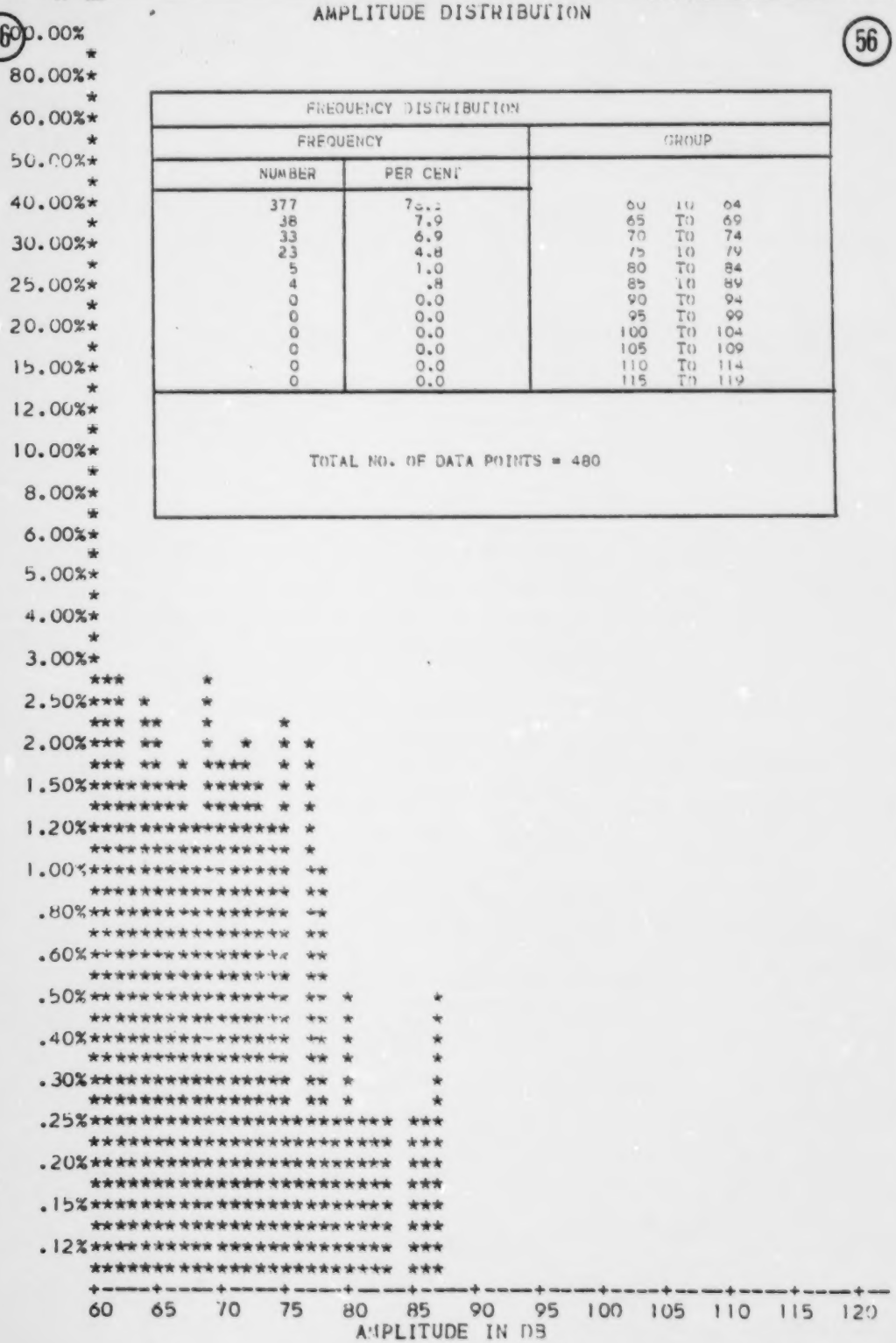
MIN. COMP. = 60 DB
MAX. COMP. = 87 DB
ARITHMETIC MEAN = 61 DB
STD. DEVIATION = 5 DB
VARIANCE = 29 DB

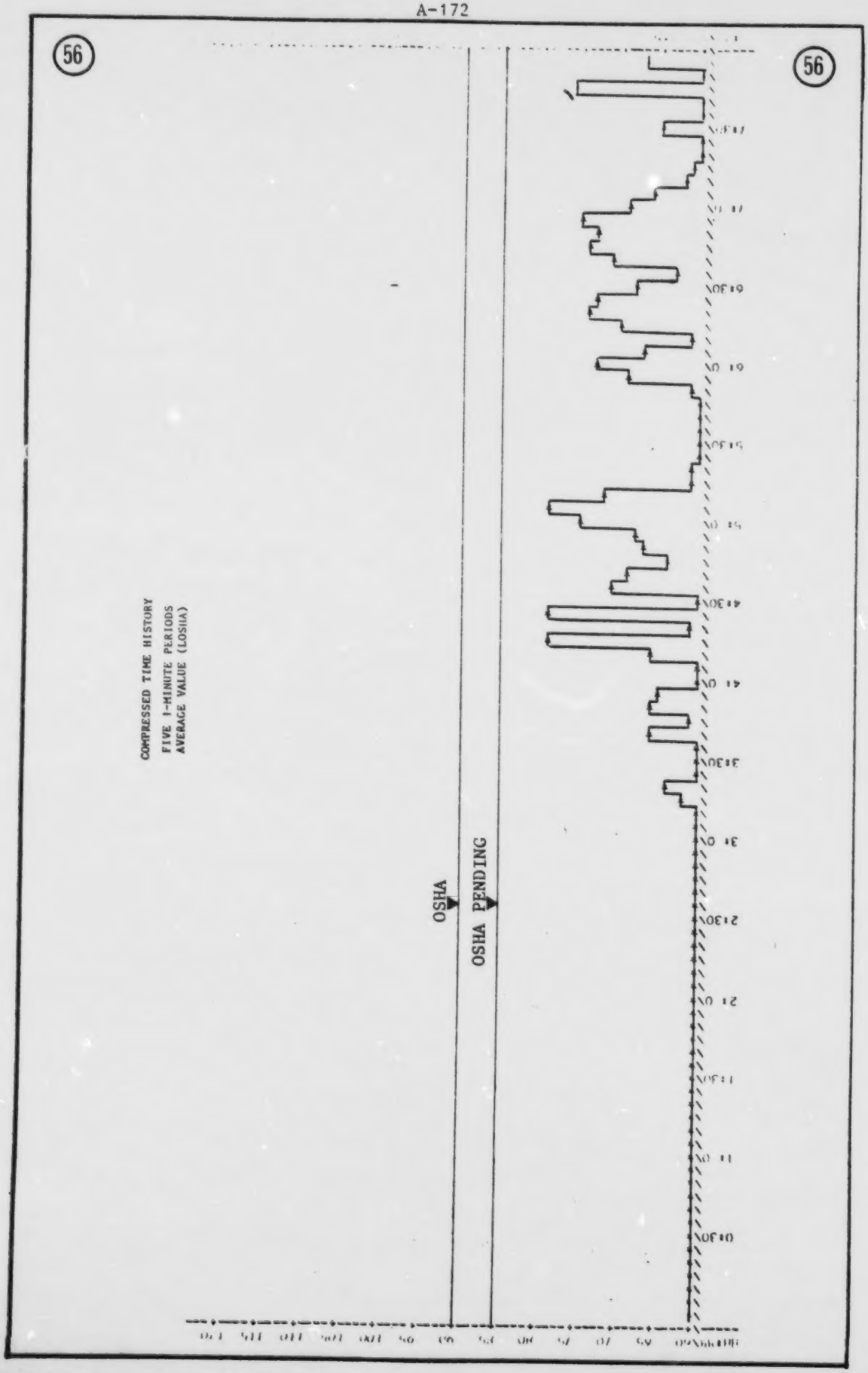
AMPLITUDE DISTRIBUTION

(56) (56)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
377	78.5	60 TO 64
38	7.9	65 TO 69
33	6.9	70 TO 74
23	4.8	75 TO 79
5	1.0	80 TO 84
4	.8	85 TO 89
0	0.0	90 TO 94
0	0.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




56
56
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:30
2:30
3:30
4:30
5:30
6:30

(57)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1221    60    64     4     1
      51      115200  440
  60  73  71  67  66  81  60  60  63  65  77  81  69  71  70  62
  60  60  62  61  62  60  60  60  60  60  60  60  60  60  60  61
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  68  60  61  60  61  60  60  60  60  62  60  69  67  72  60
  59  67  79  62  60  60  60  60  60  60  60  60  68  68  60  60
  60  60  60  60  60  60  66  68  60  63  78  91  89  83  73  85
  87  89  80  80  90  88  [illegible]  81  81  89  84  96  [illegible]  [illegible]  [illegible]  [illegible]
 100  95  95  94  96  95  96  96  96  100  101  95  84  79  80  76
  87  83  81  91  82  82  77  72  80  76  85  89  92  93  80  90
  88  80  82  80  79  81  82  82  84  89  85  83  82  82  89  76
  [illegible]  71  73  85  83  80  85  77  85  86  70  84  86  80  82  80
  80  71  82  80  80  80  80  80  80  80  71  80  [illegible]  84  86  91
  97  92  98  97  88  88  91  93  94  91  94  93  95  99  98  97
 100  98  102  102  100  100  102  100  102  102  100  100  98  95  96  93  93
  90  89  88  94  95  96  95  96  96  96  96  95  95  [illegible]  [illegible]  [illegible]
  92  88  80  83  87  78  83  73  84  82  80  74  67  80  80  81
  80  72  65  83  80  80  87  83  80  71  83  80  80  80  78  80
  72  69  80  80  80  80  80  80  80  79  74  80  87  80  80  80
  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80
  80  80  80  80  80  80  80  80  80  80  70  80  84  80  80  80
  80  82  80  88  87  85  86  80  89  80  83  80  82  76  77  86
  80  80  80  80  80  80  87  80  80  80  80  80  80  80  80  80
  88  89  80  80  80  82  80  70  80  80  80  80  80  80  80  80
  80  80  80  87  83  70  76  74  78  76  80  82  83  84  77  76
  72  74  75  90  98  87  87  83  81  88  89  92  81  73  74  79
  86  87  86  81  78  72  82  84  79  85  86  89  83  85  80  87
  84  80  83  79  81  77  81  83  77  86  90  86  88  79  82  85
  80  74  89  72  87  85  73  88  83  80  80  80  80  80  80  80
  81  82  80  83  82  84  86  70  74  89  83  82  73  88  85  83
  81  81  81  80  80  80  80  80  81  81  86  80  80  70  81  86
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 10/09/79
ENTER SITE CODE (5 CHARS) : MINEO
ENTER USER CODE (4 CHARS) : 7824
 ENTER JOB CODE (3 CHARS) : 295
```

```
   DATA LOGGED :10 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : MINEO
 SERIAL NUMBER : 1221                       JOB CODE : 295
      BASELINE : 60 DB                      USER CODE : 7824
 DYNAMIC RANGE : 86 DB                   THRESHOLD :  [illegible] DB
 SAMPLING RATE : 4/SEC                   TOTAL SAMPLES =  [illegible]
 TEST DURATION =  88  : 0                 STANDBY TIME =  01 0812
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOOK DOSE = 70 DB / 8 HRS
EXCHANGE (DOUBLE) RATE = 5 DB
THRESHOLD (CRITERIA) = 90 DB
  40 HOUR OR CORRELATIONS = 480
PERIOD = 1 MINUTES

TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	82.0	82.0	.032	.032
2	86.5	81.9	7.040	8.12
3	85.8	83.5	7.008	15.13
4	95.3	88.6	25.909	41.03
5	74.3	87.2	1.125	42.45
6	63.6	86.0	.332	42.79
7	80.6	85.4	3.414	46.20
8	74.2	84.6	1.398	47.60

MIN. COMP. = 60 DB MAX. COMP. = 102 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 13 DB
VARIANCE =169 DB

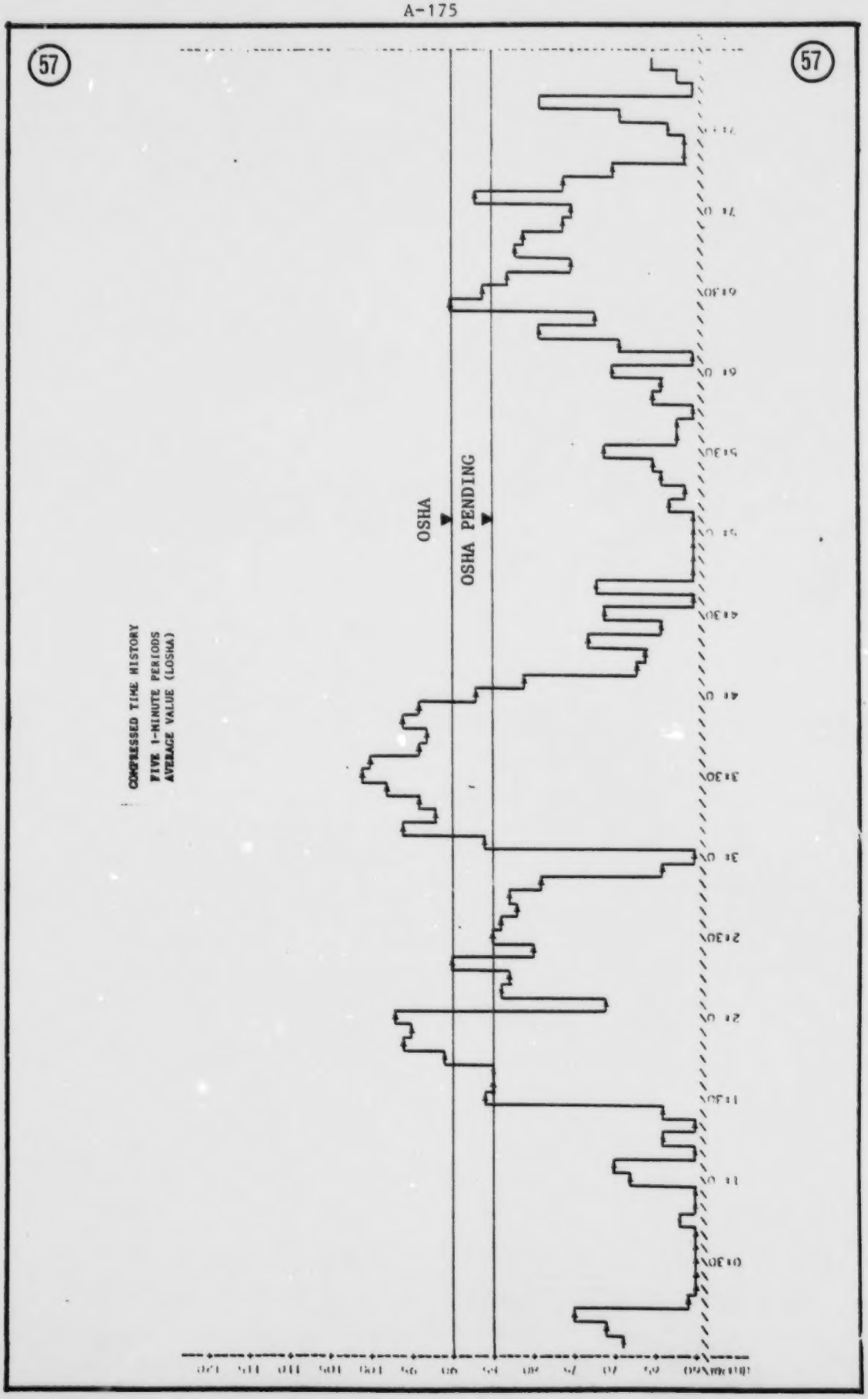
AMPLITUDE DISTRIBUTION

57

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
217	45.2	60 TO 64
43	9.0	65 TO 69
36	7.5	70 TO 74
27	5.6	75 TO 79
44	9.2	80 TO 84
41	8.5	85 TO 89
25	5.2	90 TO 94
34	7.1	95 TO 99
13	2.7	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


57
57
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dB(A)
120
115
110
105
100
95
90
85
80
75
70
65
0h30'
1h
1h30'
2h
2h30'
3h
3h30'
4h
4h30'
5h
5h30'
6h
6h30'
7h

(58)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(58)

```
  1  26  80  1214    60    64     4     1
     90      115200  480
 62  61  60  60  60  64  62  61  60  63  60  61  60  60  60  71
 71  79  76  63  74  60  64  65  62  61  67  69  70  70  75  62
 65  71  76  77  75  79  82  77  75  81  72  71  68  76  79  76
 76  62  62  60  80  73  75  61  62  64  69  73  65  73  71  76
 64  63  64  63  72  64  63  72  75  79  80  75  86  79  83  86
 88  89  92  84  72  87  87  86  87  86  87  95  89  93  91  91
 91  90  87  90  90  87  88  89  90  86  87  89  87  91  87  86
 86  89  91  86  86  84  85  85  84  86  92  91  91  90  94  97
 96  97  99  99  95  79  90  89  87  86  86  89  89  88  89  90
 90  89  96  95  93  95  93  92  92  91  89  89  89  90  87  92
 89  89  92  89  89  89  99  88  85  66  76  78  78  84  80  73
 72  67  84  76  80  79  71  60  60  60  80  90  92  93  91  90
 90  90  90  88  88  90  92  90  94  94  92  91  90  88  88  88
 88  91  91  91  90  92  90  88  86  91  89  90  91  87  88  89
 88  87  87  88  90  87  89  89  89  89  85  86  94  96  89  90
 99  94  92  92  93  93  92  92  92  92  93 100  94  93  89  87
 91  90  90  93  97 100  90  88  83  87  80  91  83  71  63  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  61  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 63  60  91  92  92  93  92  95  95  86  88  92  92  97  94  93
 91  88  90  89  88  88  88  86  89  89  89  89  88  89  90  91
 90  91  92  93  94  95  96  97  93  93  93  89  89  93  97  91
 87  89  87  88  87  90  90  88  91  91  91  90  90  91  89  90
 90  90  87  88  90  88  86  76  42  71  75  62  60  60  60  60
 60  65  64  64  60  69  63  62  63  62  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  69  71  60  60  60  60  60
*EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 00322
ENTER USER CODE (4 CHARS) : 0848
 ENTER JOB CODE (3 CHARS) : 174
```

```
     DATA LOGGED :12 SEPT 1979
          LOGGER : DB-301/26
   SERIAL NUMBER : 1214
        BASELINE : 60 DB
 DYNAMIC RANGE  : 64 DB
 SAMPLING RATE  : 4/SEC
 TEST DURATION  =   8 H 0 M 0

DATA ANALYZED  : 27 SEPT 1979
     SITE CODE : 00322
      JOB CODE : 174
     USER CODE : 0848
     THRESHOLD : 60 DB
 TOTAL SAMPLES = 115200
 STANDBY TIME  =   0 H 0 M 0
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
LOW DOSE = 90 DB / 8 HRS
AVERAGE (MODERATE) RATE = 5 DB
EXPOSURE (CLOSE) LIMIT = 3 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LOGIC SUM	LOGIC CORRELATION	MATH CORRELATION	MATH CORRELATION
1	71.5	71.5	.991	.91
2	86.2	82.1	7.375	8.34
3	90.7	86.2	13.447	22.03
4	89.3	87.1	11.242	33.31
5	87.6	87.2	8.238	42.25
6	80.0	85.9	.195	42.44
7	90.4	86.7	13.362	55.71
8	81.6	86.3	3.212	59.42

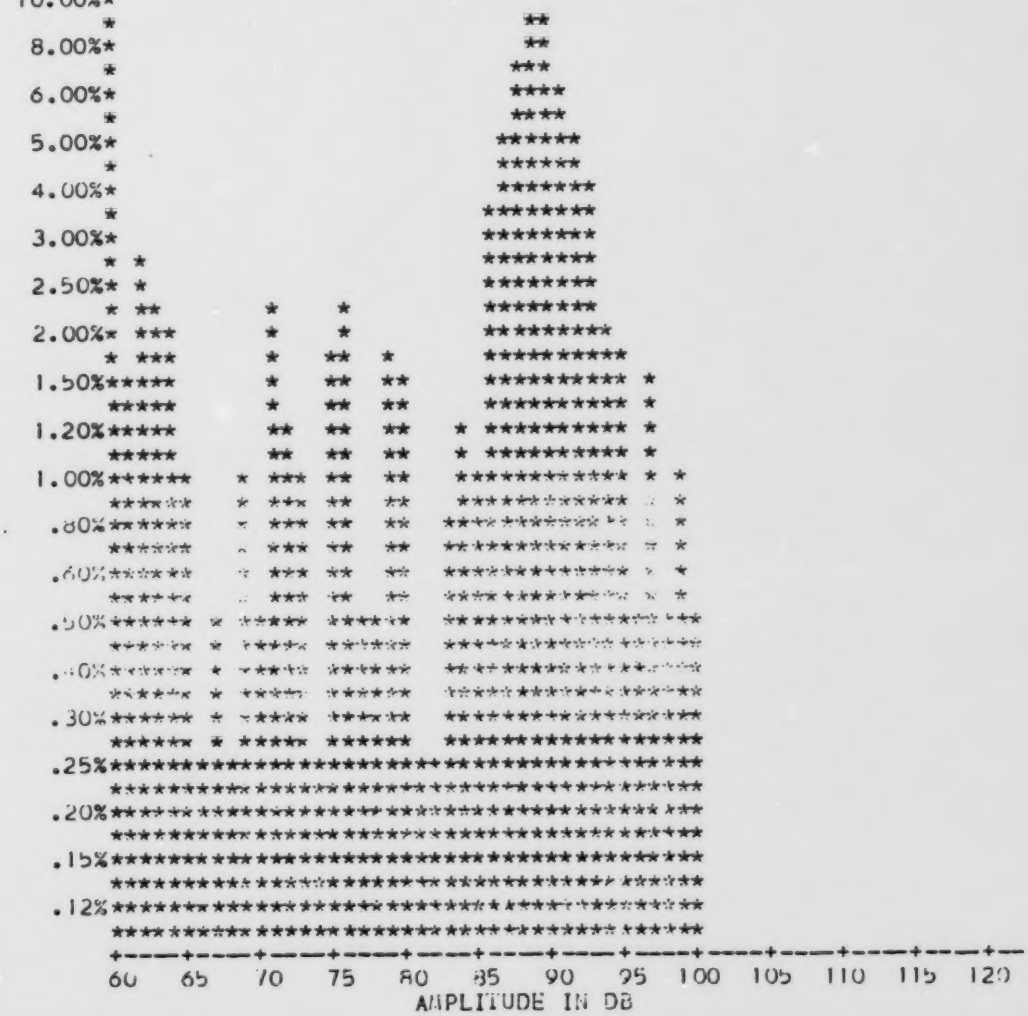
MIN. COMP. = 60 DB
ARITHMETIC MEAN = 77 DB
STD. DEVIATION = 14 DB
VARIANCE = 196 DB

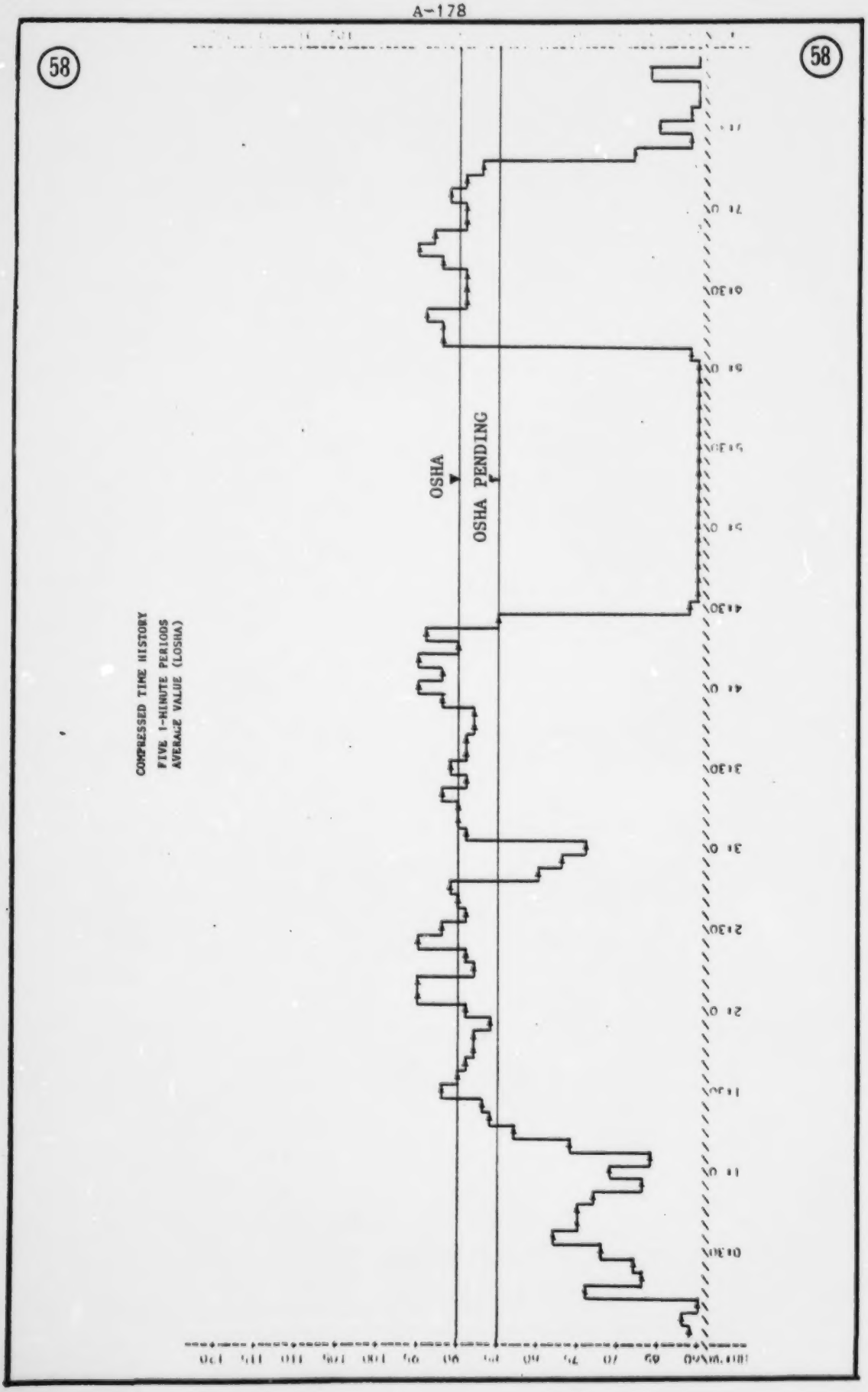
MAX. COMP. = 100 DB

58

FREQUENCY DISTRIBUTION		
FREQUENCY		RANGE
NUMBER	PER CENT	
170	35.4	60 TO 64
12	2.5	65 TO 69
21	4.4	70 TO 74
27	5.6	75 TO 79
16	3.3	80 TO 84
105	21.9	85 TO 89
106	22.1	90 TO 94
21	4.4	95 TO 99
2	.4	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




58
58
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dB(A)
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

59

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1224    60    64     4     1
     69      115200  480
 60  60  60  60  60  60  64  68  62  60  74  73  76  62  62  70
 73  63  74  73  64  61  62  60  60  70  60  71  86  87  87  85
 85  85  85  77  69  82  85  83  83  83  83  82  81  80  81  78
 79  83  78  77  82  84  82  84  82  85  83  84  89  90  88  92
 91  89  91  92  94  93  95  93  93  97  95  95 100 102  94  96
102  95 101  97  93  95  96 100  90  88  88  91  91  89  92 100
 97  95  90  89  92 101  94  92  91  91  89  89  86  88  89  85
 88  86  88  87  84  86  89  93 101  95  98  93  94  94  97  97
 94  96  94  94  92  96  92  92  91  90  91  92  92  94 102 100
 94 100 101 102  95  95 101 101  95  95  92  94  94  92  96  89
 92  92 101 101  96  91  92  91  93  99 102 102  98  98  90  83
 85  91  92  93  92  89  92  91  93  94  94  91  97  93  92  92
 92  92  93  81  97  86  75  88  90  87  91  93  93  94  91  91
 90  89  89  88  90  89  92  90  81  93  92  90  93  94  89  86
 77  78  76  79  76  74  74  65  68  84  78  81  97  99  98  95
 91  93  92  92  93  93  96  92  94  96 101  99  99  98 100  91
 83  75  79  94  83  82  85  93  94  93  94  92  96  92  80  77
 74  77  79  78  74  77  67  74  74  74  70  83  94  96  95  92
 93  94  92  93  94  93  91  86  72  82  92  90  98 100  94 100
 97  89  79  79  82  86  76  74  74  81  80  81  80  80  80  81
 82  81  81  80  81  81  81  80  81  80  81  81  81  80  80  80
 80  81  81  80  81  80  80  80  69  83  89  94  92  90  93  94
100  81  75  77  92  94  95  89  91  93  93 100 100  96  96  96
 96  93  86  90  94 100  96  95  94  94 101  92  97  98  97 100
 95 101  96  93  97  91  69  78  94  80  75  83  82  82  73  77
 73  84  77  74  75  76  80  79  78  77  76  75  66  67  65  65
 85  85  87  87  88  80  82  86  71  72  70  71  73  65  67  75
 70  76  83  87  80  75  74  74  68  70  65  64  80  81  71  72
 61  63  63  69  63  66  68  62  63  60  62  62  61  61  60  60
 60  60  60  60  65  66  78  69  71  71  61  60  60  62  70  71
%EOF

ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 2SHAF
ENTER USER CODE (4 CHARS) : 4136

 ENTER JOB CODE (3 CHARS) : FRO

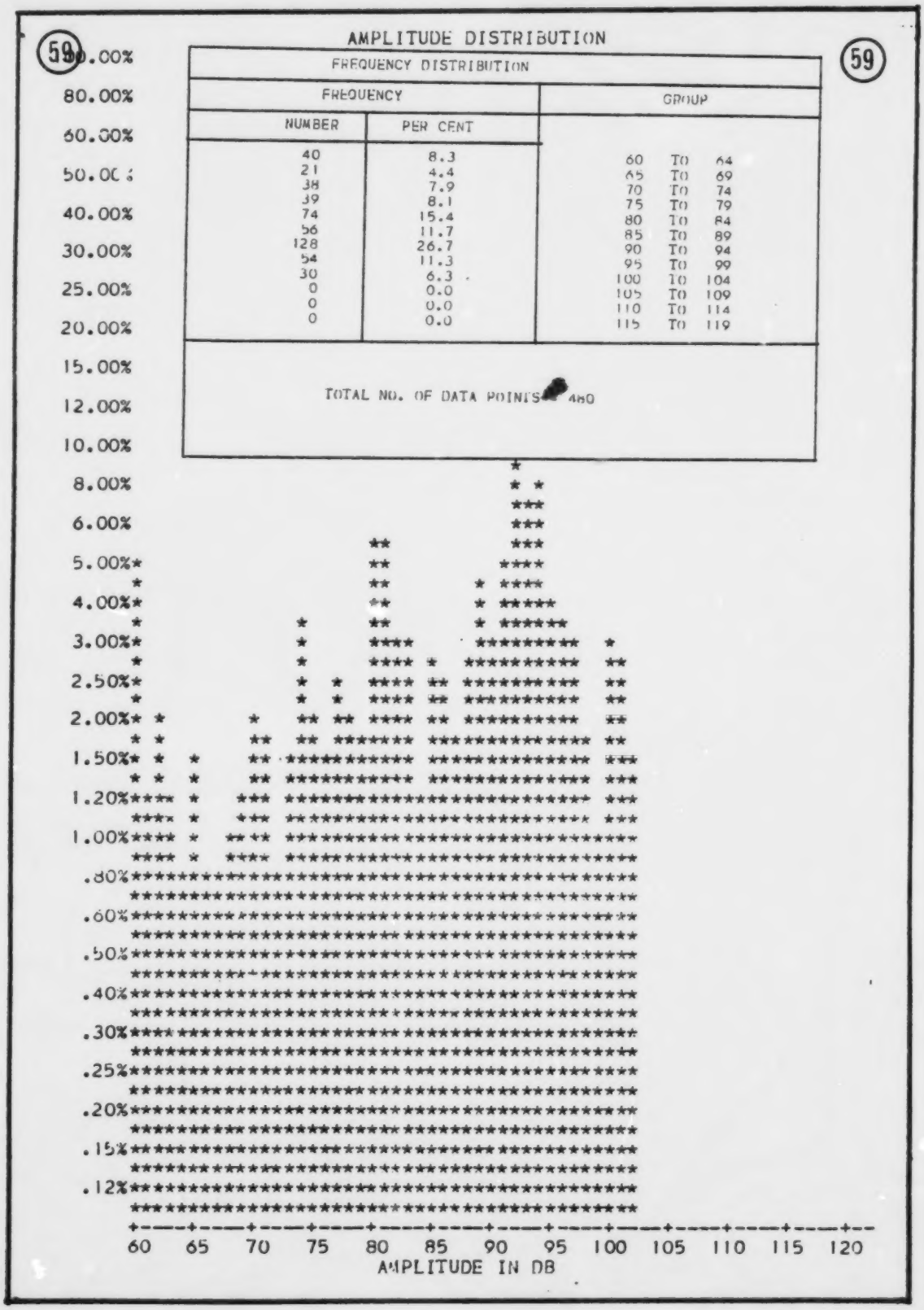
   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 2SHAF
 SERIAL NUMBER : 1224                       JOB CODE : FRO
      BASELINE : 60 DB                     USER CODE : 4136
 DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
 SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:17

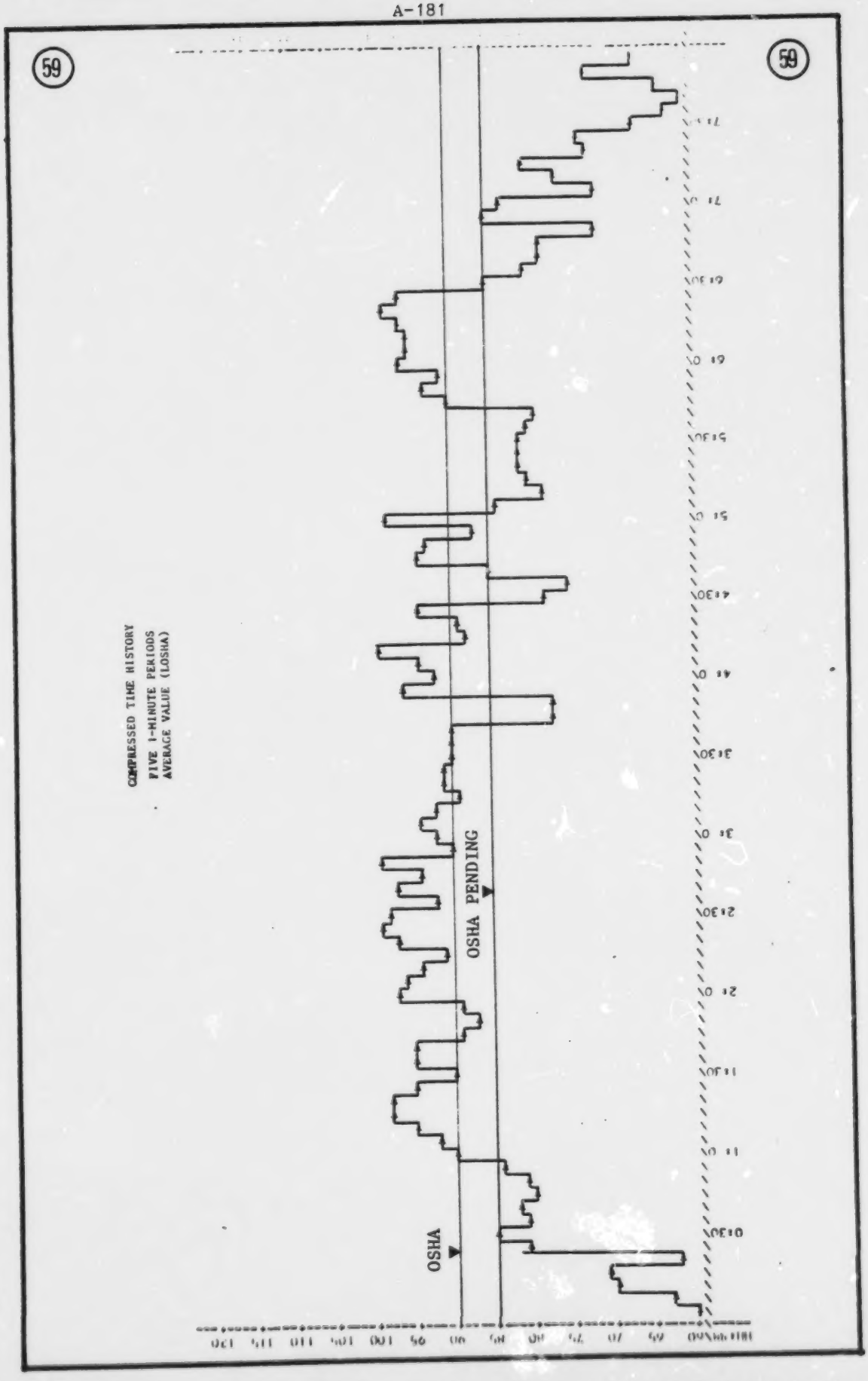
            TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                    %DOSE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1        79.0       79.0        2.723        2.72
   2        93.7       89.6       20.979       23.70
   3        95.9       92.4       28.381       52.08
   4        90.7       92.0       13.736       65.82
   5        91.5       91.9       15.457       81.28
   6        88.0       91.4        9.470       90.75
   7        92.0       91.5       16.392      107.15
   8        73.7       90.6        1.314      108.46
MIN. COMP. =  60 DB              MAX. COMP. = 102 DB
ARITHMETIC MEAN =  84 DB
STD. DEVIATION =  11 DB
VARIANCE =121 DB
```

59


AMPLITUDE DISTRIBUTION
59
59
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
40 8.3 60 TO 64
21 4.4 65 TO 69
38 7.9 70 TO 74
39 8.1 75 TO 79
74 15.4 80 TO 84
56 11.7 85 TO 89
128 26.7 90 TO 94
54 11.3 95 TO 99
30 6.3 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


59
59
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
90
95
100
105
110
115
120

(60)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
1 26 80 1225 60 64 4 1
208 115200 480

62	60	60	60	60	65	60	60	63	73	73	76	61	60	61	60
60	60	60	60	60	62	70	73	64	61	63	70	67	72	74	68
68	70	71	70	66	76	60	60	64	60	60	60	67	67	73	60
71	60	72	75	79	80	77	79	90	88	90	85	78	84	87	81
88	74	87	87	92	93	83	75	71	71	76	78	85	84	78	68
77	77	77	77	81	80	65	65	67	60	60	60	60	72	63	64
60	60	60	60	60	65	75	80	86	84	83	90	91	80	75	77
75	60	77	76	77	74	67	60	75	85	72	86	72	74	75	77
79	93	88	86	84	85	73	65	63	60	60	60	60	62	61	70
69	67	67	68	60	60	60	64	60	60	60	64	60	60	60	60
60	60	60	60	69	73	77	89	100	93	92	80	75	84	83	85
85	88	88	80	78	80	68	68	83	72	72	71	67	70	70	67
77	67	67	83	77	80	71	63	63	61	78	81	81	85	80	89
75	72	75	75	83	79	76	84	90	85	79	73	62	62	79	79
73	72	81	88	86	90	91	90	91	84	65	60	71	67	63	62
62	60	60	61	60	60	60	60	60	60	60	60	61	60	60	61
60	60	60	60	60	60	60	60	60	60	60	60	60	61	61	60
60	77	73	60	65	60	69	76	71	68	82	87	85	83	83	90
81	62	74	88	87	84	90	87	82	75	62	61	70	60	60	60
60	60	61	60	61	73	60	60	73	66	78	83	83	84	80	86
83	75	74	76	89	84	86	95	100	100	89	87	71	60	60	60
60	60	60	67	61	60	60	60	60	60	60	60	60	65	64	66
68	61	64	65	66	60	75	64	64	64	65	60	60	63	82	88
86	82	85	85	91	90	88	82	79	88	83	85	88	86	89	86
87	70	78	78	83	83	84	82	84	76	82	77	75	88	90	88
88	92	86	86	90	86	83	89	90	85	90	86	82	81	80	74
85	87	88	86	86	89	90	89	83	84	86	84	82	89	85	81
60	66	61	60	61	60	75	81	89	87	85	77	72	77	75	66
60	60	60	61	77	81	74	73	75	73	67	60	64	78	80	67
75	79	72	61	60	67	80	75	65	69	68	60	60	60	60	60

EOF

(60)

ENTER LOG DATE (DD/MM/YR) : 11/09/79
ENTER SITE CODE (5 CHARS) : 00302
ENTER USER CODE (4 CHARS) : 7669
ENTER JOB CODE (3 CHARS) : 253

DATA LOGGED : 11 SEPT 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1225
CAPACITY : 60 DF
DATA ID NUMBER : 64
DATA RATE : 4/SEC
TEST DURATION = 8[illegible]

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 00302
JOB CODE : 253
USER CODE : 7669
CHANNEL : 01
TOTAL SAMPLES = 115200
STARTING TIME = 08:0852

TIME HISTORY ANALYSIS

[illegible] CALCULATIONS
[illegible]
[illegible] =
[illegible] =
NO. OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

CHN	LOCAL		GLOBAL	
NUMBER	[illegible]	[illegible]	[illegible]	[illegible]
1	73.0	73.0	1.320	1.33
2	80.8	78.1	3.480	4.81
3	81.1	79.3	3.662	8.47
4	81.0	79.9	3.714	12.18
5	79.2	79.3	1.942	14.22
6	81.2	79.7	3.665	17.89
7	85.0	80.7	6.236	24.13
8	79.7	80.3	2.078	27.40

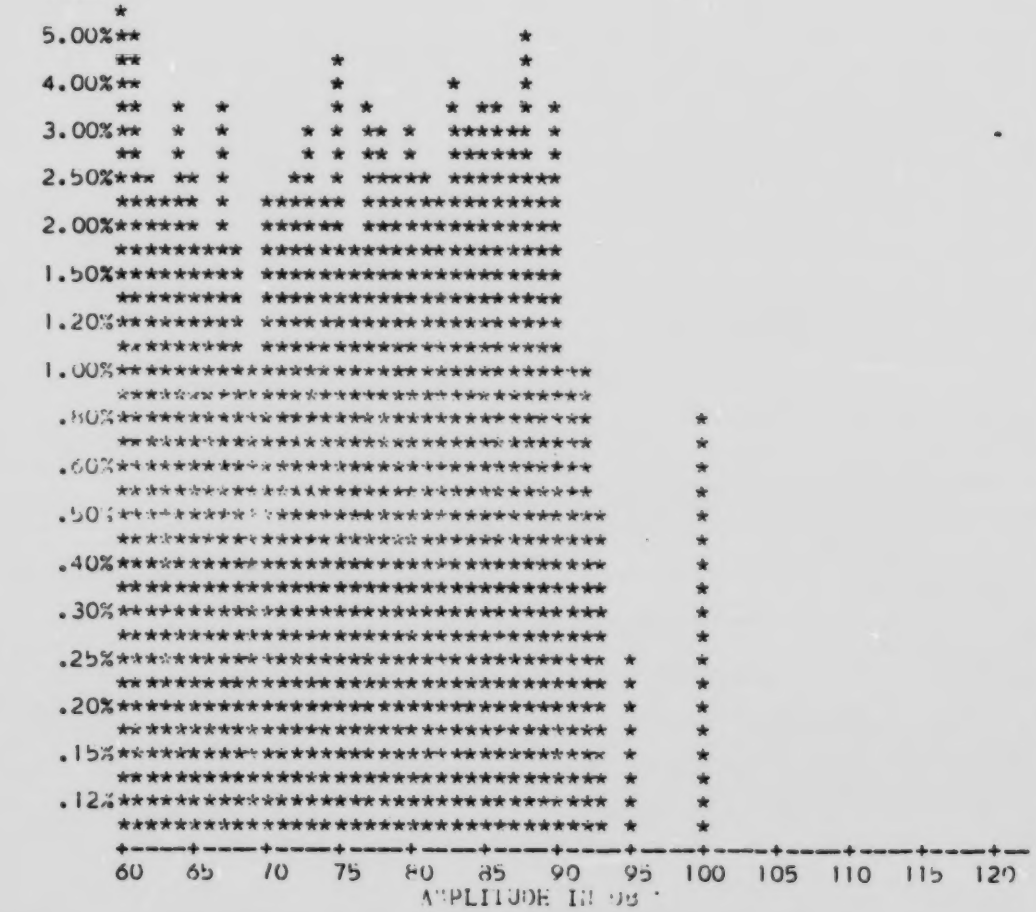
MIN. COMP. = 60 DF MAX. COMP. = 100 DF
ARITHMETIC MEAN = 72.08
STD. DEVIATION = 11.05
VARIANCE = 121.96

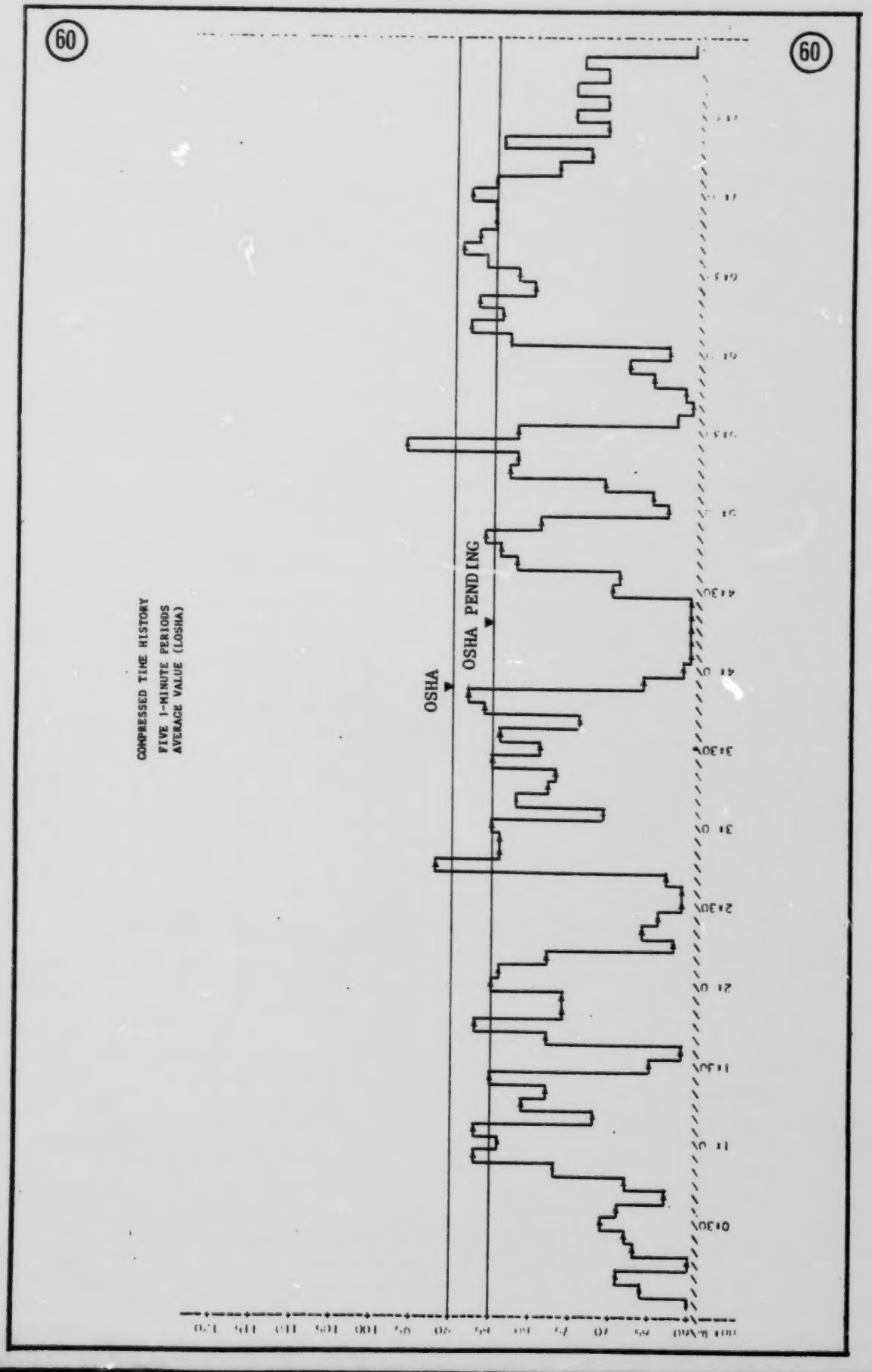
AMPLITUDE DISTRIBUTION

(60) (60)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
166	34.6	60 TO 64
43	9.0	65 TO 69
50	10.4	70 TO 74
61	12.7	75 TO 79
60	12.5	80 TO 84
71	14.8	85 TO 89
25	5.2	90 TO 94
1	.2	95 TO 99
3	.6	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




60
60
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0130
1
1130
2
2130
3
3130
4
4130

61

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214   60   64    4    1
     101     115200  480
 63  60  65  62  63  62  63  60  60  70  73  67  66  74  67  72
 62  60  62  66  74  72  67  78  77  80  78  70  61  61  65  62
 61  75  76  81  83  88  91  80  87  68  70  80  82  71  86  87
 81  82  81  81  69  89  78  82  79  70  86  96  88  82  88  76
 78  80  79  75  80  88  86  87  98  91  75  75  82  83  79  84
 94  92  84  83  82  84  85  84  81  73  70  78  76  84  80  0
 86 100  92  77  87  80  92  82  71  79  69  85  87  85  80  83
 82  79  74  70  79  84  87  89  90  77  88  85  84  75  83  89
 83  81  83  82  82  87  88  91  93  85  86  90  87  81  78  77
 70  71  70  64  74  80  77  70  74  72  65  63  68  66  67  74
 64  64  60  73  68  72  69  72  80  80  87  76  83  83  85  91
 88  88  75  77  66  87  77  78  83  89  98  94  96  92  84  79
 83  96  79  77  88  80  87  88  80  81  68  83  93  75  79  71
 80  84  96  84  82  75  82  83  77  73  81  88  88  86  85  86
 88  85  85  89  85  79  80  77  82  80  79  81  88  78  80  81
 86  85  96 100  97  90  72  71  77  67  72  85  82 101  90 105
 81  78  79  72  79  82  81  82  92  92  72  98  88  96  74  71
 72  64  74  79  84  76  88  89  90  94  78  85  81  81  79  78
 71  79  81  61  66  61  60  61  60  61  60  60  60  60  60  60
 60  61  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  64  62  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  70  82  78  82
 84  82  84  93  84  82  82  80  88  87  97  90  91  94  90  77
 86  90  89  88  87  92  89  83  86  84  87  81  87  82  82  86
 87  88  96  81  77  93  86  88  85  79  83  83  81  84  85 100
 98  92  83  91  85  85  81  82  82  88  86  88  99  93  92  91
 89  88  88  89  87  90  90  88  92  84  90  86  91  93  96 102
 84  80  84  84  80  89  82  67  73  75  84  75  70  79  84  69
 74  67  71  68  67  67  60  60  72  68  79  64  65  79  76  83
 80  74  76  63  64  72  72  70  64  66  76  79  78  70  67  64
%EOF
```

61

```
ENTER LOG DATE (DD/MM/YR) : 16/08/79
ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 0790
 ENTER JOB CODE (3 CHARS) : CAT
```

```
   DATA LOGGED :16  AUG 1979          DATA ANALYZED : 21 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 00000
SERIAL NUMBER : 1214                       JOB CODE : CAT
     BASELINE : 60 DB                     USER CODE : 0790
DYNAMIC RANGE : 64 DB                     THRESHOLD :  60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0:25
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGMA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	79.2	79.2	2.408	2.41
2	85.6	83.1	6.838	9.65
3	82.5	82.9	4.390	14.04
4	85.9	83.8	7.106	21.14
5	87.9	84.8	9.294	30.44
6	73.1	83.8	1.196	31.63
7	89.2	84.8	11.197	42.83
8	83.6	84.7	5.133	47.96

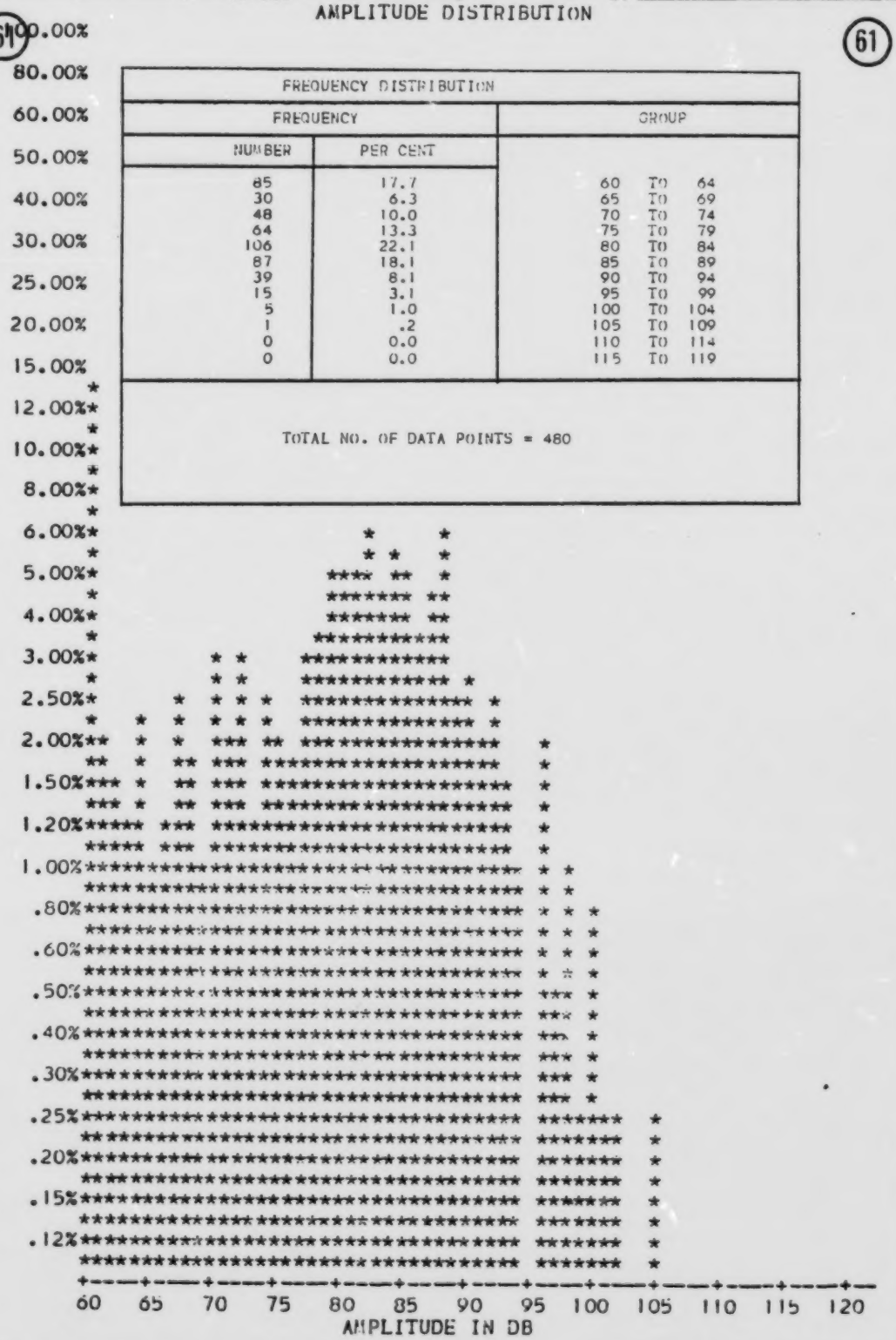
```
MIN. COMP. =  60 DB                MAX. COMP. = 105 DB
ARITHMETIC MEAN =  78 DB
STD. DEVIATION =  11 DB
VARIANCE =121 DB
```

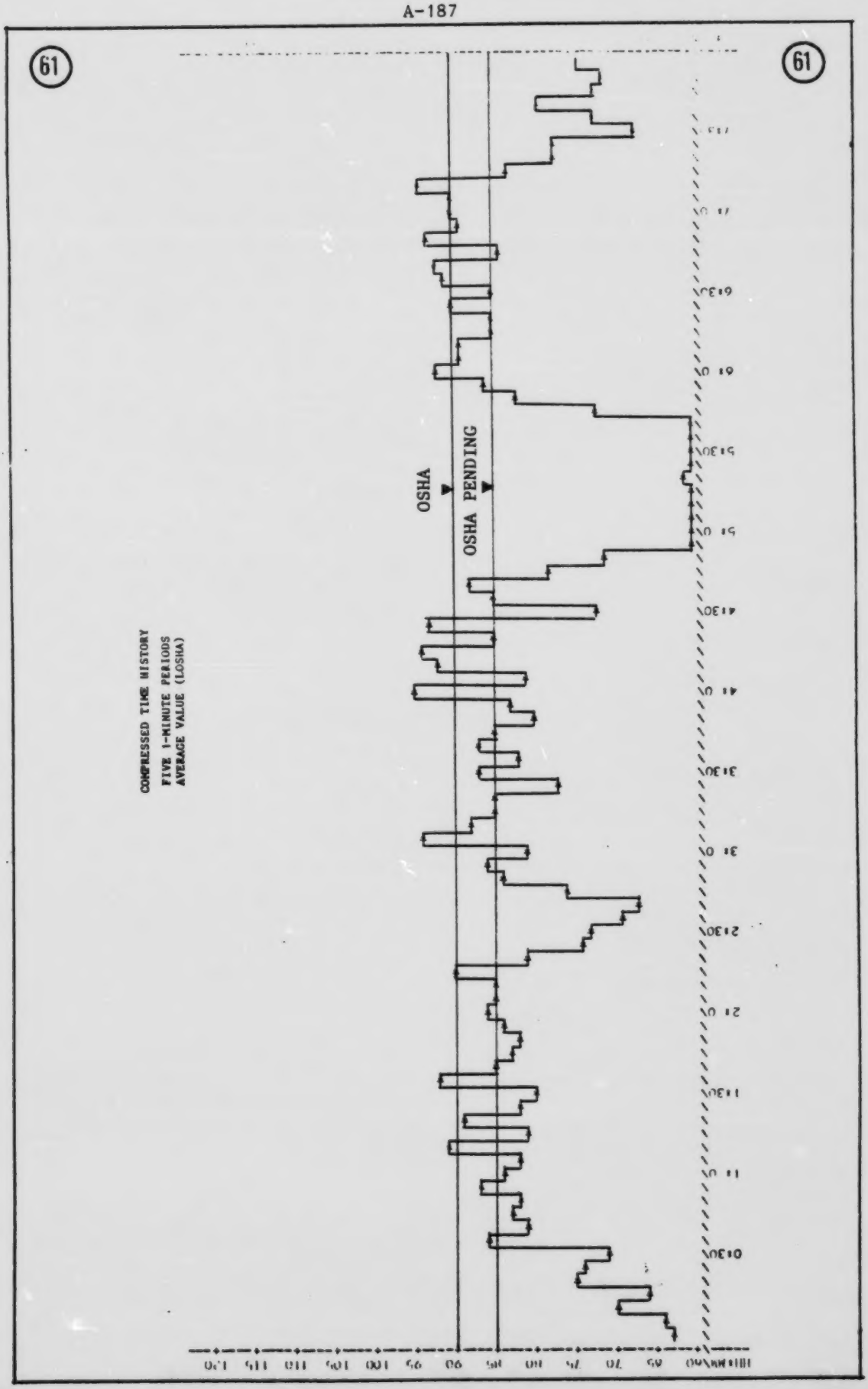
AMPLITUDE DISTRIBUTION

(61) (61)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
85	17.7	60 To 64
30	6.3	65 To 69
48	10.0	70 To 74
64	13.3	75 To 79
106	22.1	80 To 84
87	18.1	85 To 89
39	8.1	90 To 94
15	3.1	95 To 99
5	1.0	100 To 104
1	.2	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




61
61
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

62

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

62

1 26 80 1213 60 64 4 1
160 115200 480

64	71	60	66	79	60	60	60	67	66	67	69	75	84	78	60
60	60	66	71	62	73	68	79	76	74	68	71	79	84	74	60
62	62	60	60	60	60	74	67	73	70	71	72	60	64	60	64
75	72	77	76	80	84	75	62	60	60	60	60	60	76	68	65
80	76	75	76	87	76	70	69	77	81	81	60	60	63	77	71
72	67	71	72	80	91	81	70	70	62	69	60	64	72	60	60
60	60	62	73	72	73	70	64	77	66	74	76	68	60	64	63
91	93	90	84	87	92	62	68	60	86	90	84	68	66	64	73
89	90	85	85	89	87	68	89	90	87	88	88	88	78	83	69
74	69	77	73	79	64	61	62	62	60	60	74	63	77	60	64
61	60	61	60	61	60	60	60	60	61	60	60	60	60	62	61
62	60	61	60	60	62	74	72	79	82	71	77	84	88	87	88
85	89	91	88	81	83	86	86	74	60	77	73	66	88	87	75
70	82	64	67	66	68	78	80	85	88	77	73	60	64	72	61
64	83	75	80	85	70	85	86	75	71	80	92	61	61	63	60
60	62	66	72	83	75	83	84	77	70	74	68	73	60	72	67
67	60	61	61	65	66	64	60	63	63	62	62	69	60	60	60
60	60	60	62	60	60	60	60	60	60	61	60	60	60	60	60
60	60	60	60	60	61	60	61	60	65	60	60	65	60	60	60
61	60	60	60	63	60	60	60	60	60	61	61	60	60	60	60
60	61	65	60	60	60	60	62	72	75	70	76	66	64	78	68
63	60	60	62	60	85	91	90	89	93	87	89	85	89	85	93
95	95	91	90	86	80	75	76	78	80	86	75	78	70	83	93
96	94	94	99	96	90	100	94	94	87	79	75	84	76	78	70
67	72	60	69	86	83	87	79	78	88	86	82	84	82	83	90
90	89	89	90	90	89	87	91	80	85	84	85	88	86	84	68
73	62	60	78	80	78	66	60	61	60	61	67	60	60	60	60
62	65	77	79	85	86	79	77	67	70	63	61	60	60	64	60
60	72	69	60	60	60	60	60	60	60	60	60	60	61	60	60
62	60	60	69	70	60	60	60	68	77	68	67	64	63	60	62

%EOF

ENTER LOG DATE (DD/MM/YR) : 27/08/79
ENTER SITE CODE (5 CHARS) : 1SHAF
ENTER USER CODE (4 CHARS) : 4412

ENTER JOB CODE (3 CHARS) : 253

DATA LOGGED :27 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1213
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 1SHAF
JOB CODE : 253
USER CODE : 4412
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:0

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	OSHA		NOISE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	72.2	72.2	1.059	1.06
2	79.1	76.4	2.740	3.80
3	79.6	77.7	2.974	6.77
4	81.3	78.7	3.719	10.49
5	68.3	77.5	.614	11.11
6	81.5	78.4	3.852	14.96
7	87.5	80.6	8.838	23.79
8	69.9	79.9	.775	24.57

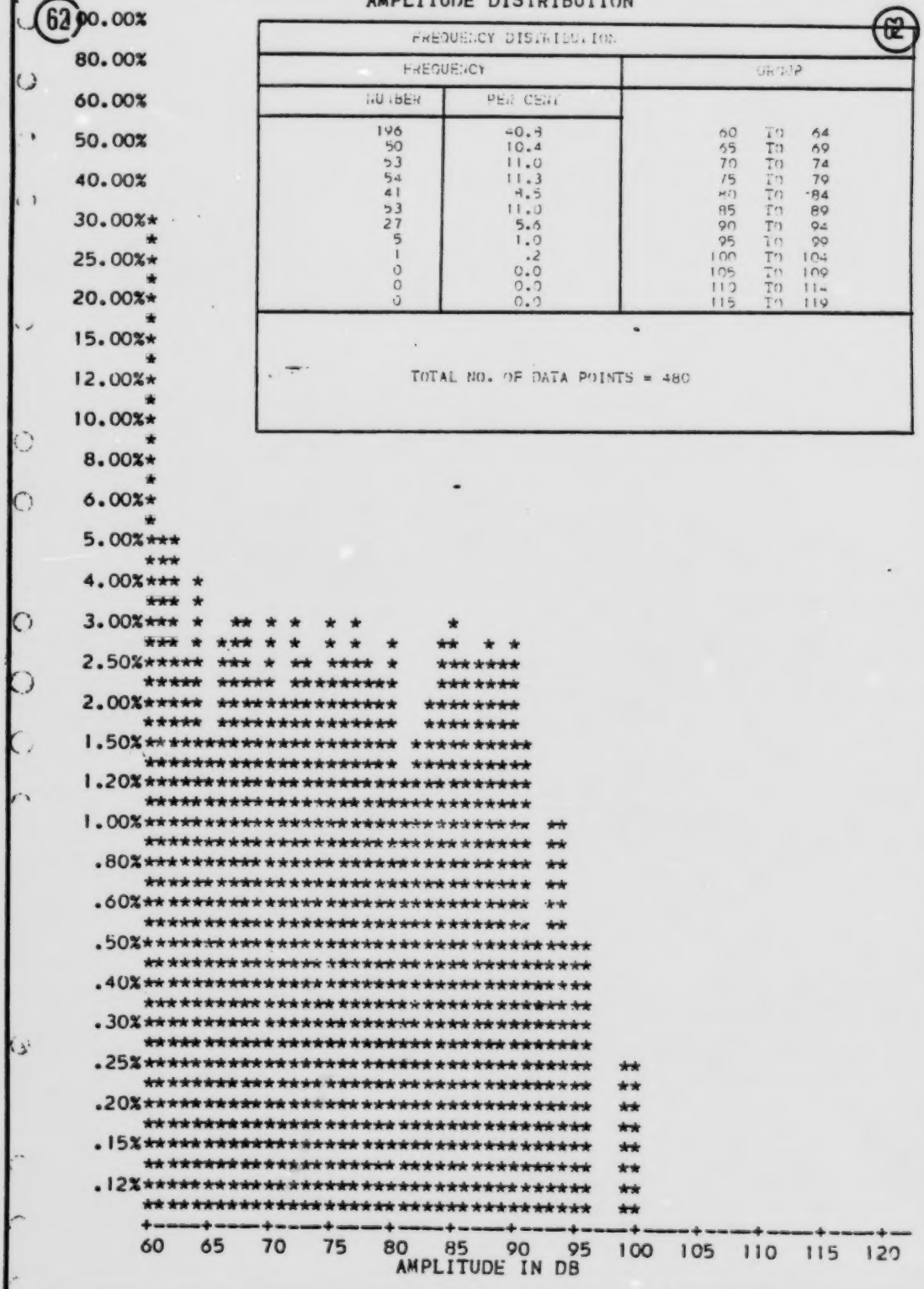
MIN. COMP. = 60 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 11 DB
VARIANCE =121 DB
MAX. COMP. = 100 DB

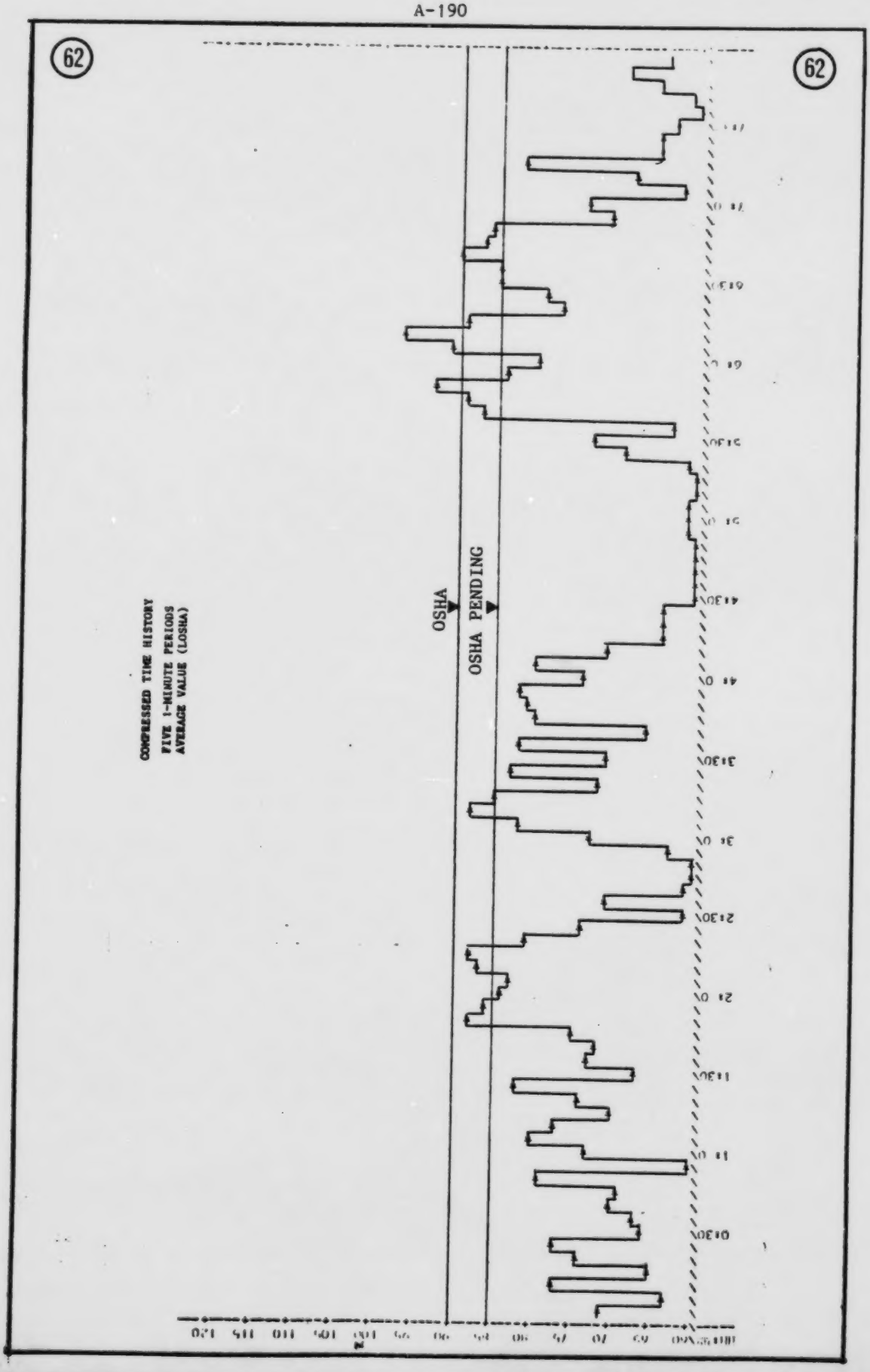
AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
196	40.8	60 TO 64
50	10.4	65 TO 69
53	11.0	70 TO 74
54	11.3	75 TO 79
41	8.5	80 TO 84
53	11.0	85 TO 89
27	5.6	90 TO 94
5	1.0	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




62
62
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dB(A)
0130
1100
2130
2100
3130
3100
4130
4100
5130
6100
6130
7100

(63)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1220    60    64     4     1
     284      115200   480
 60  60  60  60  60  60  63  63  66  62  60  76  70  60  60  60
 63  68  62  63  66  60  60  60  84  67  61  80  63  63  60  60
 60  66  60  73  68  67  62  68  63  67  74  80  78  88  79  92
 70  71  65  79  76  71  67  80  66  66  60  60  60  61  60  63
 60  60  60  74  61  69  84  85  87  86  75  85  76  89  85  69
 61  74  70  60  62  60  60  60  60  60  60  60  60  62  61  60
 74  68  78  66  74  72  60  61  60  64  76  80  77  88  97  84
 67  60  60  73  69  75  78  77  83  73  75  89  86  86  81  73
 60  67  73  73  60  90  93  72  60  60  60  60  60  64  90  85
 61  85  60  60  60  60  60  61  60  62  60  78  91  76  67  72
 86  74  72  86  74  72  81  76  63  71  84  86  79  60  76  77
 86  75  84  85  66  84  84  86  83  82  69  67  83  81  85  82
 75  86  60  75  77  60  81  77  83  81  91  90  75  86  85  83
 86  83  83  83  86  80  81  72  77  76  79  82  71  75  79  74
 82  80  78  82  62  60  72  82  80  74  70  71  73  68  68  87
 77  86  88  86  88  65  70  67  81  88  82  80  77  86  95  82
 60  60  82  87  82  60  63  87  91  83  86  80  94  80  83  60
 60  86  60  82  81  68  80  82  88  87  87  87  87  87  86  83
 82  83  82  83  91  81  89  85  88  86  80  85  79  75  78  90
 69  90  78  60  60  60  60  60  60  60  73  82  81  81  71  60
 60  60  60  60  77  77  91  92  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  85  93  83
 60  62  60  61  60  69  87  80  86  83  64  83  79  72  75  73
 85  78  62  75  70  60  68  85  79  80  71  83  79  77  66  64
 60  60  76  90  88  66  81  83  85  83  76  60  60  60  60  83
%EOF

ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 2SHAF

ENTER USER CODE (4 CHARS) : 2829
 ENTER JOB CODE (3 CHARS) : CTE

   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 2SHAF
SERIAL NUMBER : 1220                       JOB CODE : CTE
     BASELINE : 60 DB                     USER CODE : 2829
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 Db
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 1:11

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 Db / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 Db
THRESHOLD (CUTOFF) LEVEL = 80 Db
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                        %DOSE
HOUR    CURRENT  CUMULATIVE          CURRENT  CUMULATIVE
   1      74.2      74.2              1.396      1.40
   2      77.6      76.1              2.255      3.65
   3      80.4      77.0              3.312      6.96
   4      80.8      79.7              3.479     10.44
   5      84.1      80.2              5.514     15.96
   6      74.8      79.5              1.528     17.48
   7      60.0      78.5               .105     17.58
   8      78.6      78.5              2.681     20.26
MIN. COMP. =  60 DB                 MAX. COMP. =  97 DB
ARITHMETIC MEAN =  70 DB
STD. DEVIATION =  11 DB
VARIANCE =121 DB
```

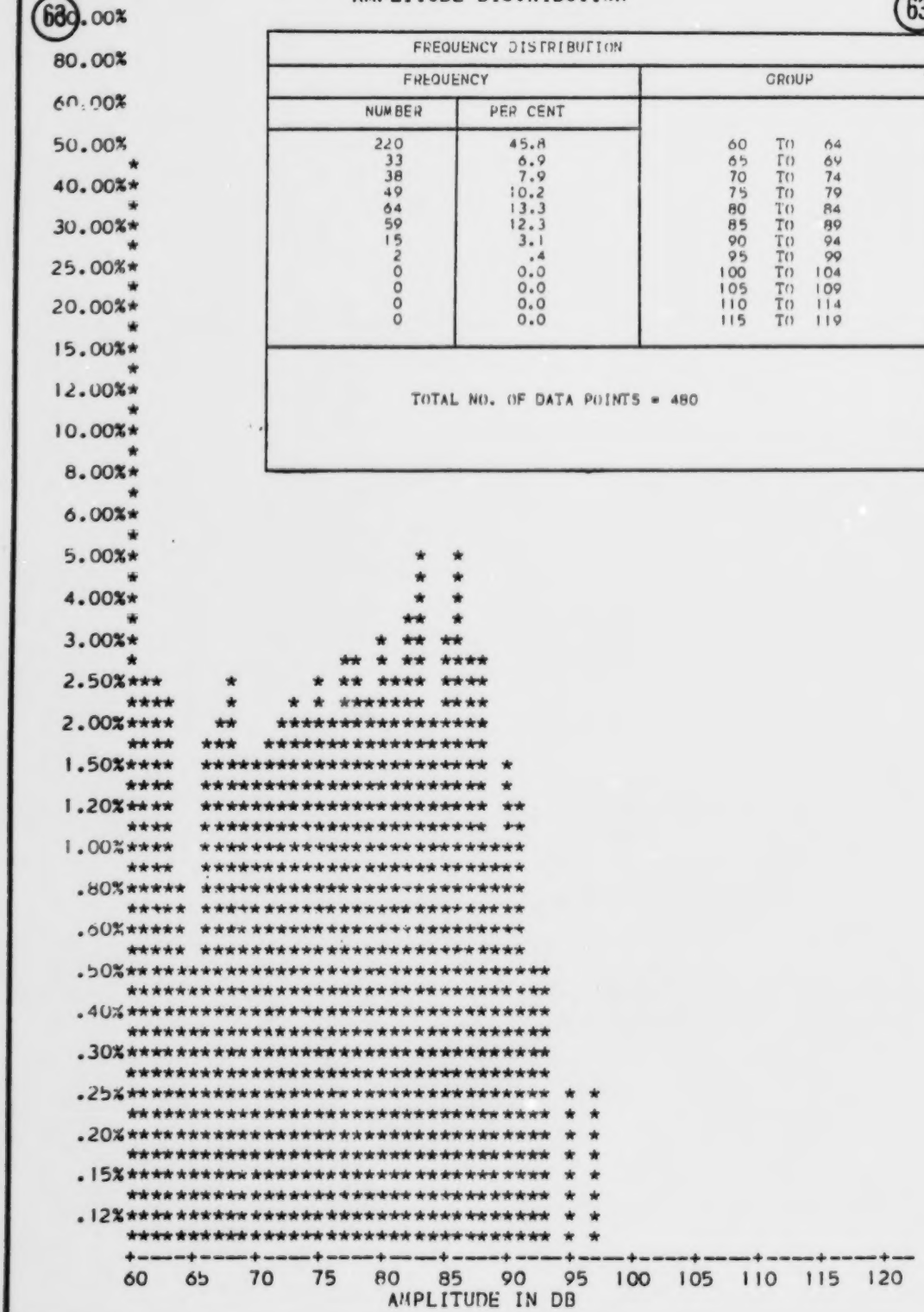
(63)

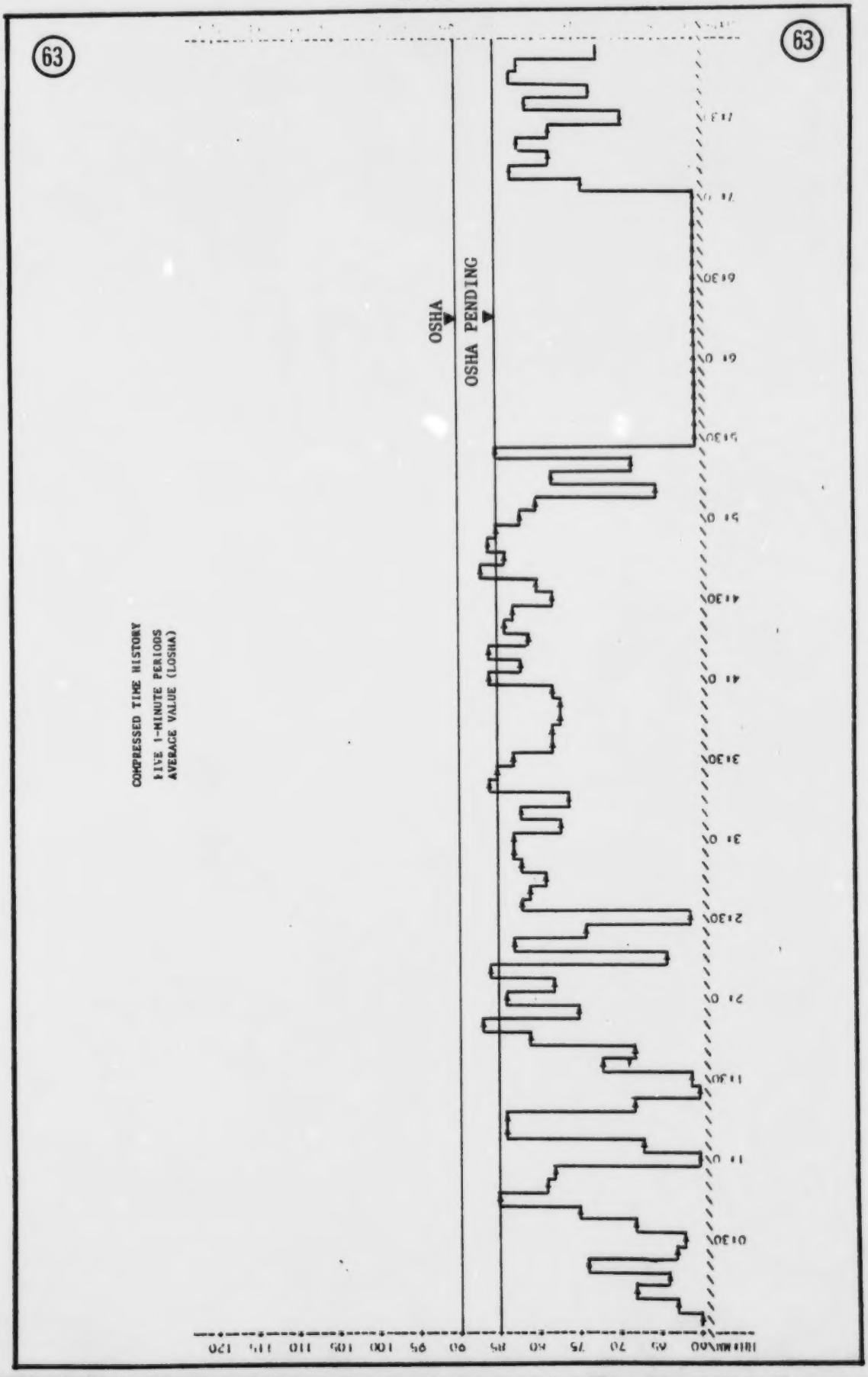
AMPLITUDE DISTRIBUTION

(63) (63)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
220	45.8	60 TO 64
33	6.9	65 TO 69
38	7.9	70 TO 74
49	10.2	75 TO 79
64	13.3	80 TO 84
59	12.3	85 TO 89
15	3.1	90 TO 94
2	.4	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




63
63
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
dBA
60
65
70
75
80
85
90
95
100
105
110
115
120
01:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30

(64)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

1 26 80 1220 60 64 4 1
106 115200 4H0

62	60	60	60	60	60	62	61	61	65	66	74	73	60	62	67
74	77	65	61	61	60	60	71	63	69	72	70	78	67	63	67
63	63	73	69	69	67	71	73	68	80	80	78	78	67	82	80
57	78	60	76	78	67	85	78	60	72	74	64	67	67	62	60
60	65	68	66	60	60	73	71	77	65	73	77	63	62	62	89
65	63	65	65	74	74	83	79	74	71	84	84	78	81	76	78
64	61	60	76	78	63	60	64	82	66	73	71	70	75	71	72
94	86	91	94	85	87	86	95	97	93	95	98	94	92	94	96
95	94	94	93	94	94	94	96	90	85	61	70	89	89	90	92
74	64	60	60	72	64	81	79	73	85	71	86	71	61	68	86
79	60	77	70	61	61	69	72	64	64	71	82	93	91	94	98
94	87	91	83	95	92	89	94	95	92	94	94	93	90	91	92
91	94	93	87	90	92	96	90	90	60	60	61	60	70	60	79
69	60	62	62	60	61	65	60	74	78	67	96	74	92	62	92
90	90	71	84	75	60	84	92	93	92	98	100	99	99	99	99
99	95	79	75	66	85	83	86	81	84	79	85	60	60	60	63
63	70	62	63	60	61	60	64	60	60	81	61	60	60	69	64
62	61	60	60	61	61	60	60	62	74	73	81	60	60	73	66
79	89	93	93	93	92	91	91	89	92	87	95	87	94	87	73
80	65	77	87	96	96	96	86	87	78	78	79	81	82	60	71
75	68	80	64	63	80	60	77	73	62	60	60	60	60	60	60
60	60	60	60	60	60	60	60	63	60	75	76	60	91	89	90
90	91	82	84	80	85	95	86	89	90	94	90	90	90	89	89
94	90	86	89	73	73	88	88	78	82	76	69	94	77	78	77
81	78	78	74	84	84	84	81	77	89	91	83	86	90	77	95
90	91	88	87	88	79	87	89	87	88	89	88	82	71	63	77
75	82	95	94	94	95	92	95	94	89	89	91	94	91	96	93
88	93	85	92	92	77	93	83	81	70	92	93	85	87	87	84
77	65	92	89	75	76	77	82	80	76	71	60	75	85	81	85
67	65	60	60	66	65	78	83	61	60	60	60	60	60	60	60

%EOF

(64)

ENTER LOG DATE (DD/MM/YR) : 10/09/79
ENTER SITE CODE (5 CHARS) : 00303

ENTER USER CODE (4 CHARS) : 4709
ENTER JOB CODE (3 CHARS) : 253

DATA LOGGED :10 SEPT 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1220
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 11 : 0

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 00303
JOB CODE : 253
USER CODE : 4709
TIMESHARE : 40 TU
TOTAL SAMPLES = 115200
STARTUP TIP = 11 11 16

TIME HISTORY ANALYSIS

NOISE EXPOSURE [L05 (M.S.I.)] CALCULATIONS
AVERAGE OF THE POPULATION
LOWER LIMIT = 40 DB / 40 DB
HIGHER (CONTROLLED) RATE = 5 DB
INDIVIDUAL (CRITERIA) LIMIT = 7 DB
NUMBER OF COMPUTATIONS = 440
PERIOD = 1 MINUTES

CLASS	FREQUENCY		PROBABILITY	
MIDPOINT	OBSERVED	CUMULATIVE	NUMBER	CUMULATIVE
1	12.9	12.9	1.174	1.17
2	81.5	78.4	3.847	5.02
3	86.1	84.2	9.559	14.58
4	90.7	89.0	13.741	28.32
5	84.4	89.5	5.001	33.32
6	83.0	85.2	5.164	38.63
7	86.6	87.5	8.057	46.69
8	90.5	89.0	7.956	54.64

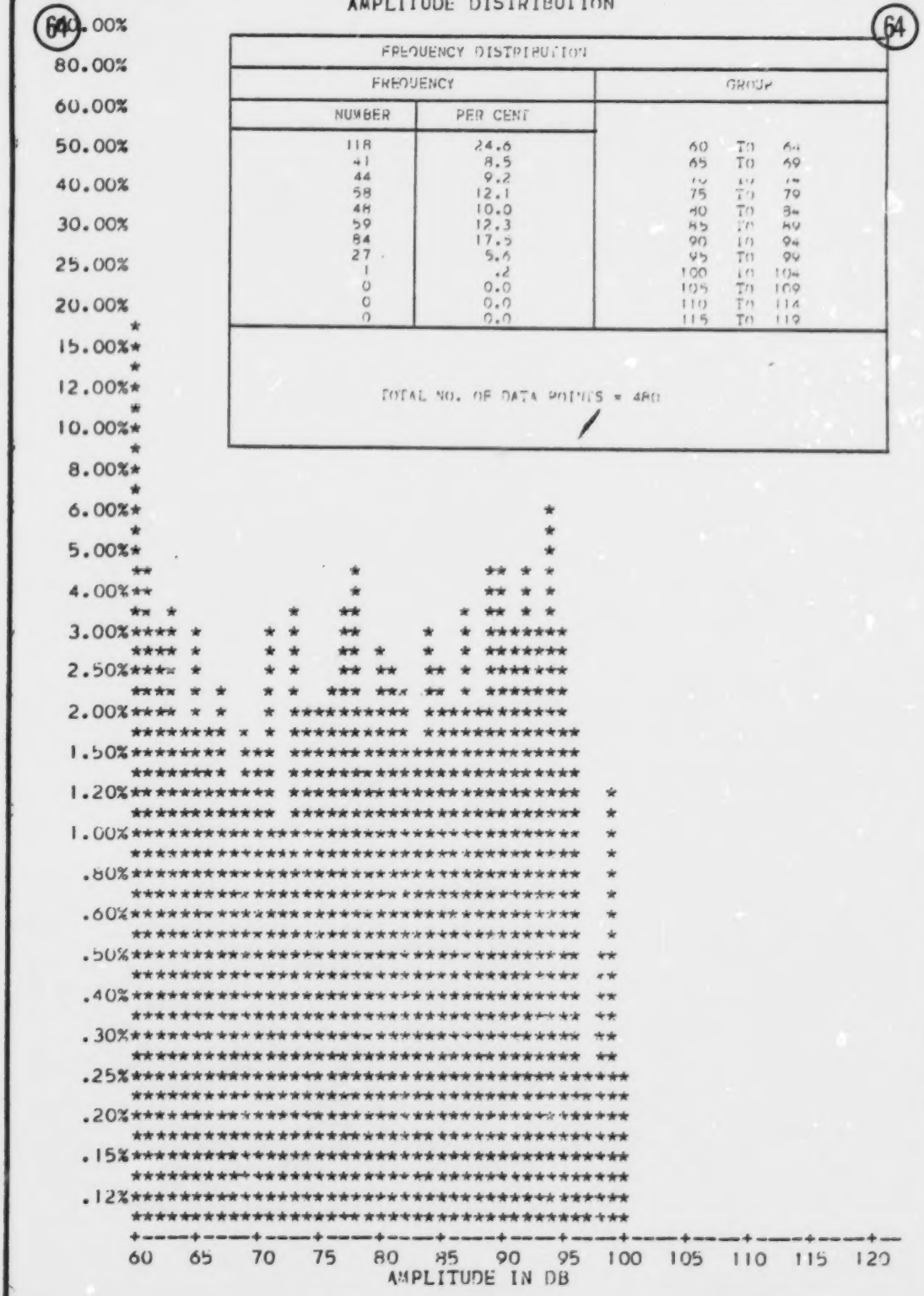
MIN. COMP. = 60 DB MAX. COMP. = 100 DB
ARITHMETIC MEAN = 77 DB
STD. DEVIATION = 12 DB
VARIANCE = 144 DB

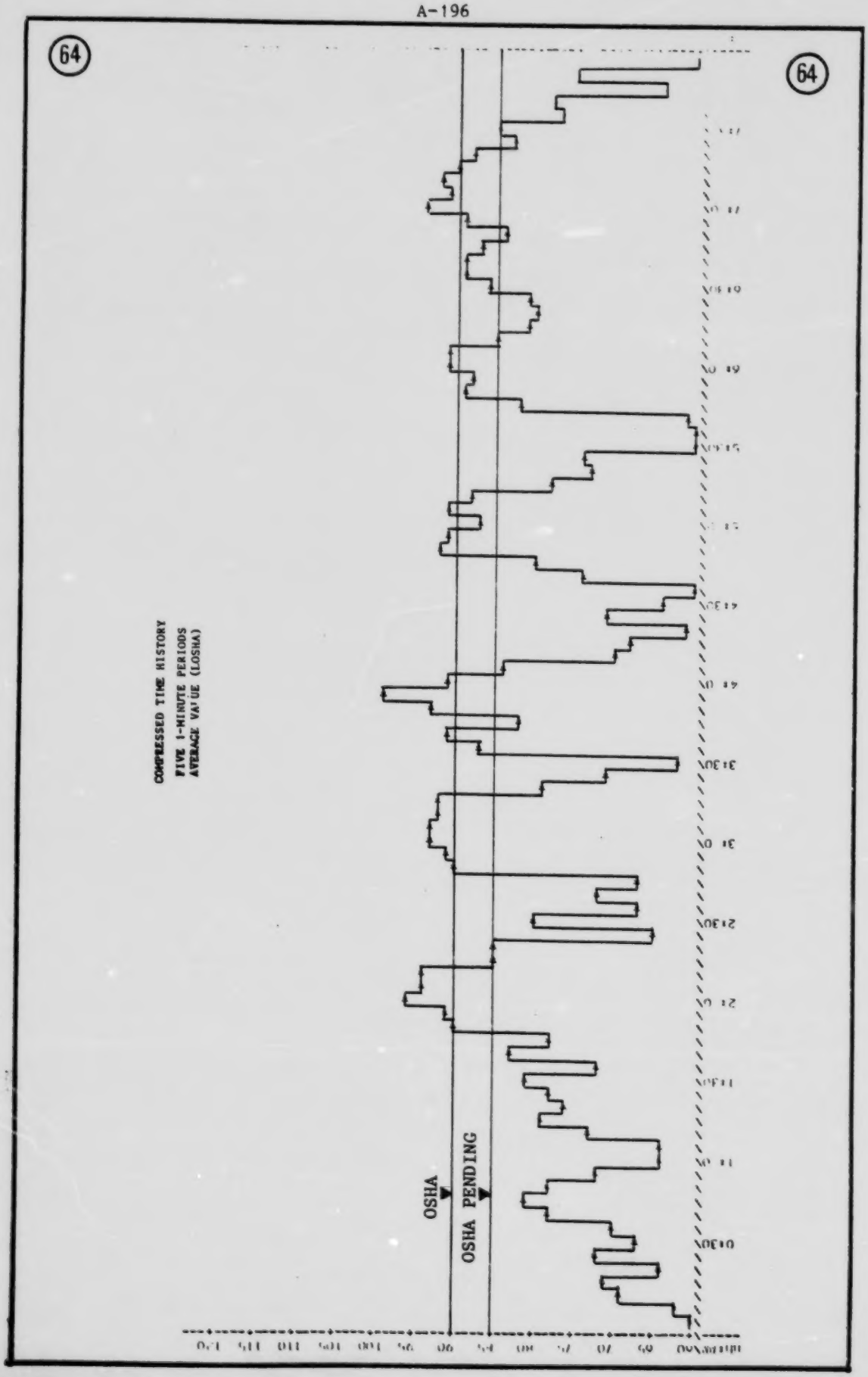
AMPLITUDE DISTRIBUTION

64 64

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
118	24.6	60 TO 64
41	8.5	65 TO 69
44	9.2	70 TO 74
58	12.1	75 TO 79
48	10.0	80 TO 84
59	12.3	85 TO 89
84	17.5	90 TO 94
27	5.6	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




64
64
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
21:30
31:30
41:30

(65)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 60 1213 60 64 4 1
94 115200 480

62	65	66	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	61	60	60	60	75	72	61	74
65	60	61	60	60	62	60	83	79	79	86	78	60	60	64	60
60	65	68	67	60	64	71	79	69	64	65	74	65	73	66	67
68	64	62	66	60	67	62	64	61	73	65	60	60	63	73	73
82	65	66	78	73	75	80	79	76	62	63	83	64	74	71	67
64	80	61	84	69	65	72	94	92	64	62	63	71	76	72	78
67	67	72	66	60	67	67	70	64	60	61	80	64	73	73	73
70	62	63	62	73	78	69	76	74	63	73	68	60	61	65	62
70	71	74	68	76	73	101	104	80	102	83	99	77	88	101	80
99	60	100	67	101	60	99	71	102	65	97	86	101	85	95	85
95	96	91	92	90	99	84	93	89	99	83	94	86	89	74	98
63	60	60	60	60	60	60	60	60	60	60	60	61	60	60	100
85	87	97	88	91	102	97	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	103	60	95	60	101	60	96	77	101
60	94	82	88	69	60	60	60	61	63	63	60	94	98	87	60
85	60	60	60	60	60	60	60	60	60	61	61	60	60	69	60
60	60	60	60	69	60	60	72	81	79	60	60	60	60	60	62
66	62	60	60	60	60	60	60	60	60	60	60	61	71	60	60
60	60	60	60	60	60	60	60	60	60	64	69	60	71	75	73
70	74	72	81	73	67	70	68	67	77	67	72	73	68	76	75
79	101	94	97	99	63	93	100	100	103	95	86	103	74	93	85
89	102	91	88	98	99	88	90	93	101	85	95	88	99	84	96
60	68	60	60	60	60	60	60	60	60	60	60	60	60	63	96
81	89	79	60	64	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	62	60	60	60	60	60	60	60	60	60	60
60	60	60	60	68	61	60	60	60	66	60	60	60	87	95	85
96	85	98	81	80	95	86	63	85	60	80	83	77	67	66	66
70	71	77	71	69	76	72	70	67	60	77	75	78	67	77	82

%EOF

(65)

ENTER LOG DATE (DD/MM/YR) : 28/08/79
ENTER SITE CODE (5 CHARS) : ISHAF

ENTER USER CODE (4 CHARS) : 7537
ENTER JOB CODE (3 CHARS) : 252

DATA LOGGED :28 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1213
BASELINE : 60 DB
DYNAMIC RANGE : 54 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

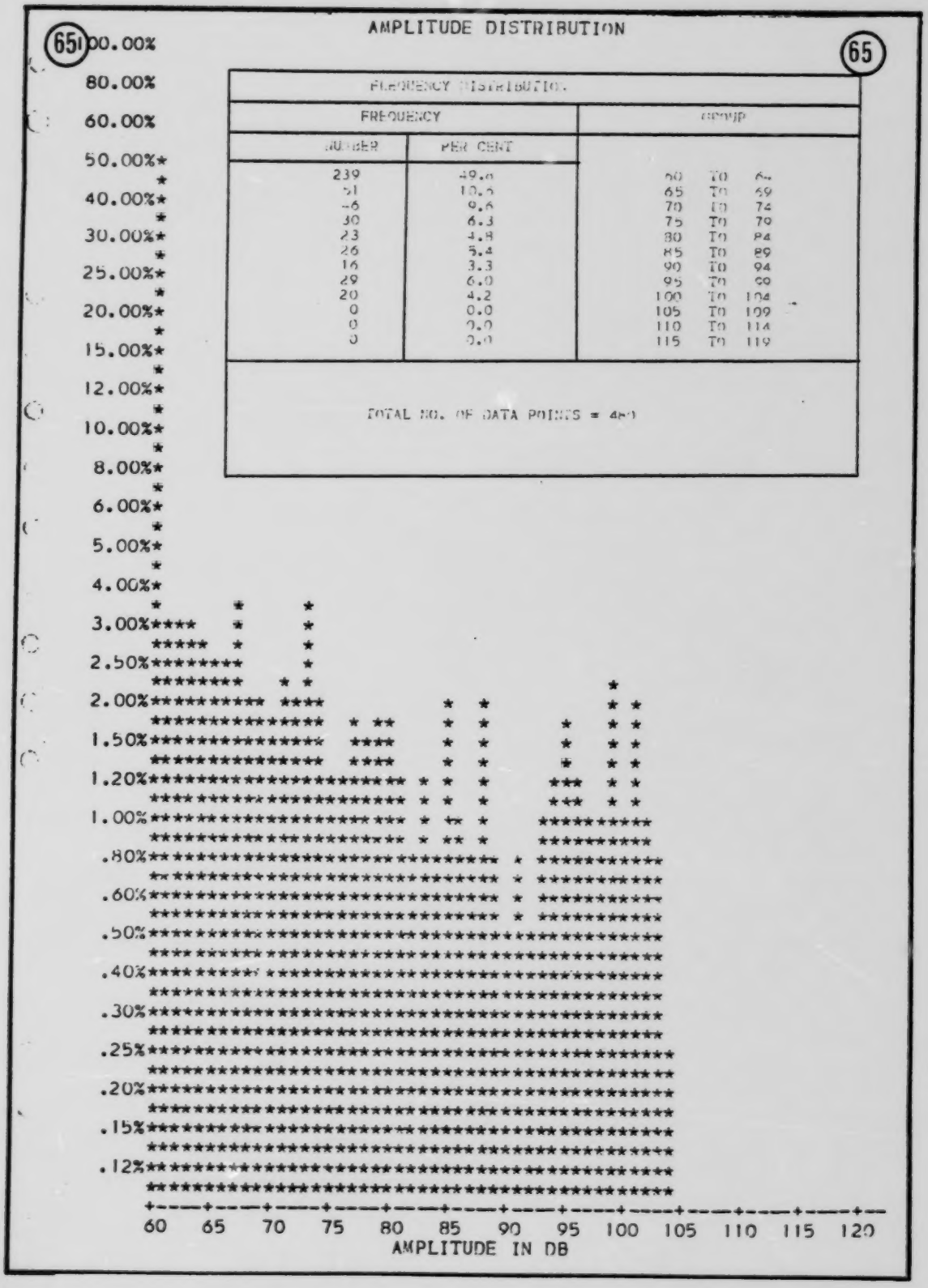
DATA ANALYZED : 26 SEPT 1979
SITE CODE : ISHAF
JOB CODE : 252
USER CODE : 7537
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:23

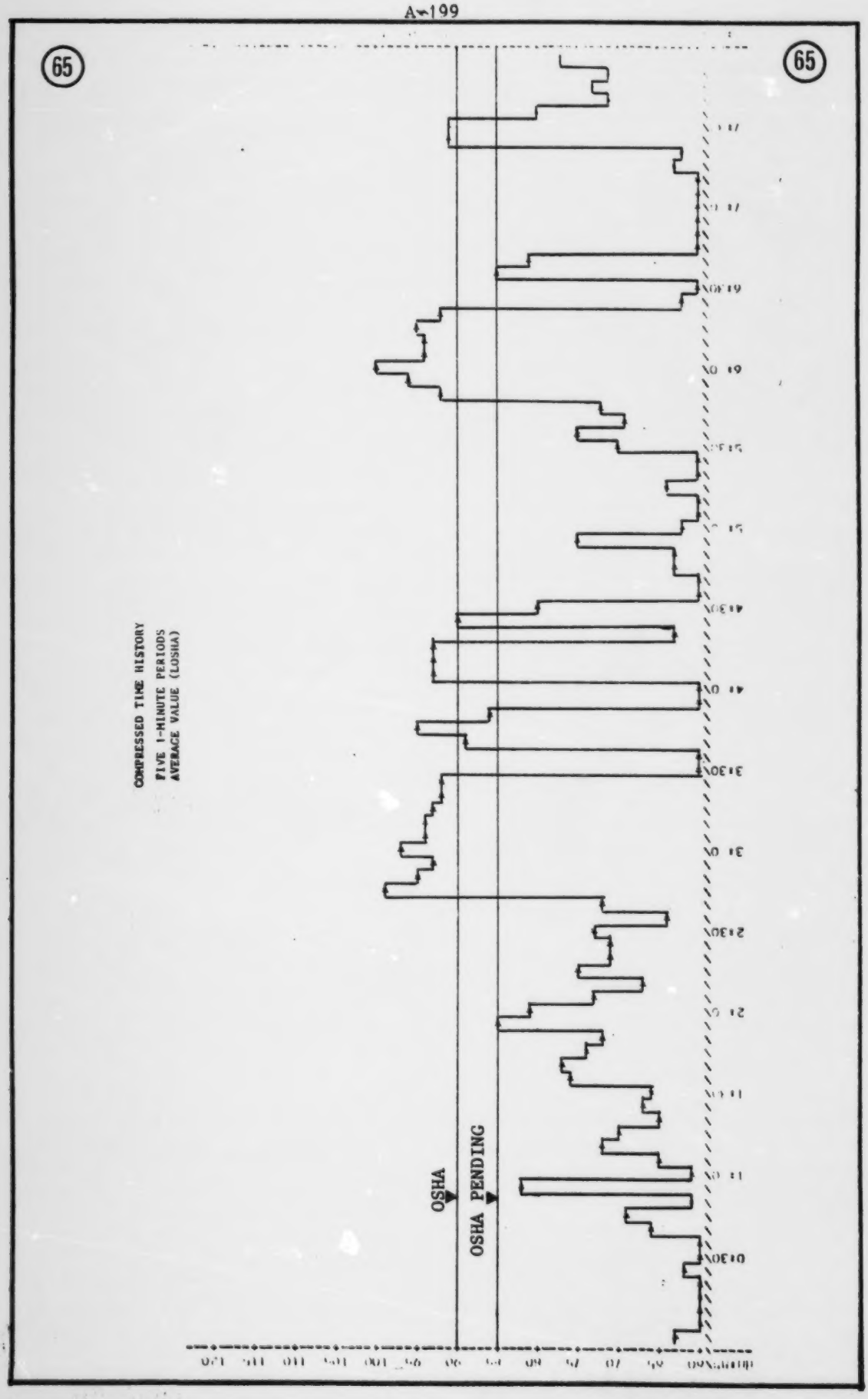
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME HOUR	LOGA CURRENT	LOGA CUMULATIVE	DOSE CURRENT	DOSE CUMULATIVE
1	67.2	67.9	.582	.58
2	73.8	71.4	1.316	1.90
3	86.2	80.5	8.111	10.01
4	91.1	84.9	14.500	24.51
5	89.0	84.9	9.227	33.74
6	82.3	84.5	4.310	38.05
7	89.6	85.5	11.860	49.91
8	80.4	85.0	3.288	53.20

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 70 DB
STD. DEVIATION = 13 DB
VARIANCE = 162 DB
MAX. COMP. = 104 DB


AMPLITUDE DISTRIBUTION
65
65
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
239 49.6 50 TO 64
51 10.6 65 TO 69
46 9.6 70 TO 74
30 6.3 75 TO 79
23 4.8 80 TO 84
26 5.4 85 TO 89
16 3.3 90 TO 94
29 6.0 95 TO 99
20 4.2 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


65
65
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
80
85
90
95
100
105
110
115
120

66

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "CARRIAGE RETURN"

1 20 30 1217 60 64 4 1
21483 10/011 457

66	77	64	77	69	65	75	76	73	60	62	60	70	60	63	75
60	66	61	62	62	61	60	60	65	70	62	60	60	60	61	60
72	62	60	60	60	60	60	72	60	60	60	72	72	71	69	63
73	75	60	65	65	65	73	75	69	60	77	77	72	67	67	65
66	60	65	66	60	60	60	60	60	60	60	60	65	60	61	60
60	60	60	60	67	60	71	60	63	64	63	64	62	60	66	62
62	63	60	60	61	60	60	61	60	60	60	62	60	60	63	77
75	79	71	70	64	79	63	70	67	62	70	66	65	62	69	71
61	66	73	60	64	71	60	66	72	60	60	72	61	70	65	60
69	66	61	71	64	61	72	66	60	71	66	60	71	65	60	71
65	60	73	66	62	72	65	63	73	60	64	72	60	71	75	67
70	60	69	72	61	64	70	66	71	72	60	61	72	73	61	61
74	71	70	60	72	60	66	71	60	68	72	60	62	73	60	72
65	78	79	81	72	76	65	81	77	71	67	72	77	72	69	71
67	60	77	79	74	72	60	67	72	64	68	77	66	66	72	60
68	71	66	69	71	60	74	76	60	68	89	93	92	95	94	91
88	88	88	88	89	87	86	86	84	86	86	83	83	84	82	82
82	85	83	82	82	83	86	85	81	82	83	82	82	82	82	82
81	81	85	84	82	82	82	82	84	84	84	82	82	82	82	83
87	86	89	85	87	87	88	87	83	83	82	92	82	83	82	86
84	82	81	82	83	82	81	83	84	83	82	81	82	82	81	82
82	83	82	82	84	84	85	82	82	83	83	83	82	82	81	82
82	82	83	82	83	83	84	83	83	85	86	84	89	83	82	83
82	81	86	91	85	81	83	82	83	82	82	83	83	82	82	86
82	82	82	83	82	82	82	81	82	82	83	82	86	84	83	82
85	87	82	93	86	86	85	84	79	83	85	87	87	84	86	80
80	79	80	80	81	86	85	80	80	80	81	77	81	81	80	87
85	84	82	80	80	86	89	80	80	81	85	84	81	80	80	87
87	87	87	87	87	86	86	86	87	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

EOF

ENTER LOG DATE (DD/MM/YR) : 04/07/79
ENTER SITE CODE (5 CHARS) : SKIP2
ENTER USER CODE (4 CHARS) : 2505
ENTER JOB CODE (3 CHARS) : 101

DATA LOGGED : 6 JULY 1979
LOGGER : DL-3C1/26
SERIAL NUMBER : 1217
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 7457132

DATA ANALYZED : 29 AUG 1979
SITE CODE : SKIP2
JOB CODE : 101
USER CODE : 2505
THRESHOLD : 60.00
TOTAL SAMPLES = 1429411
STARTING AT = 1822432

TIME HISTORY ANALYSIS

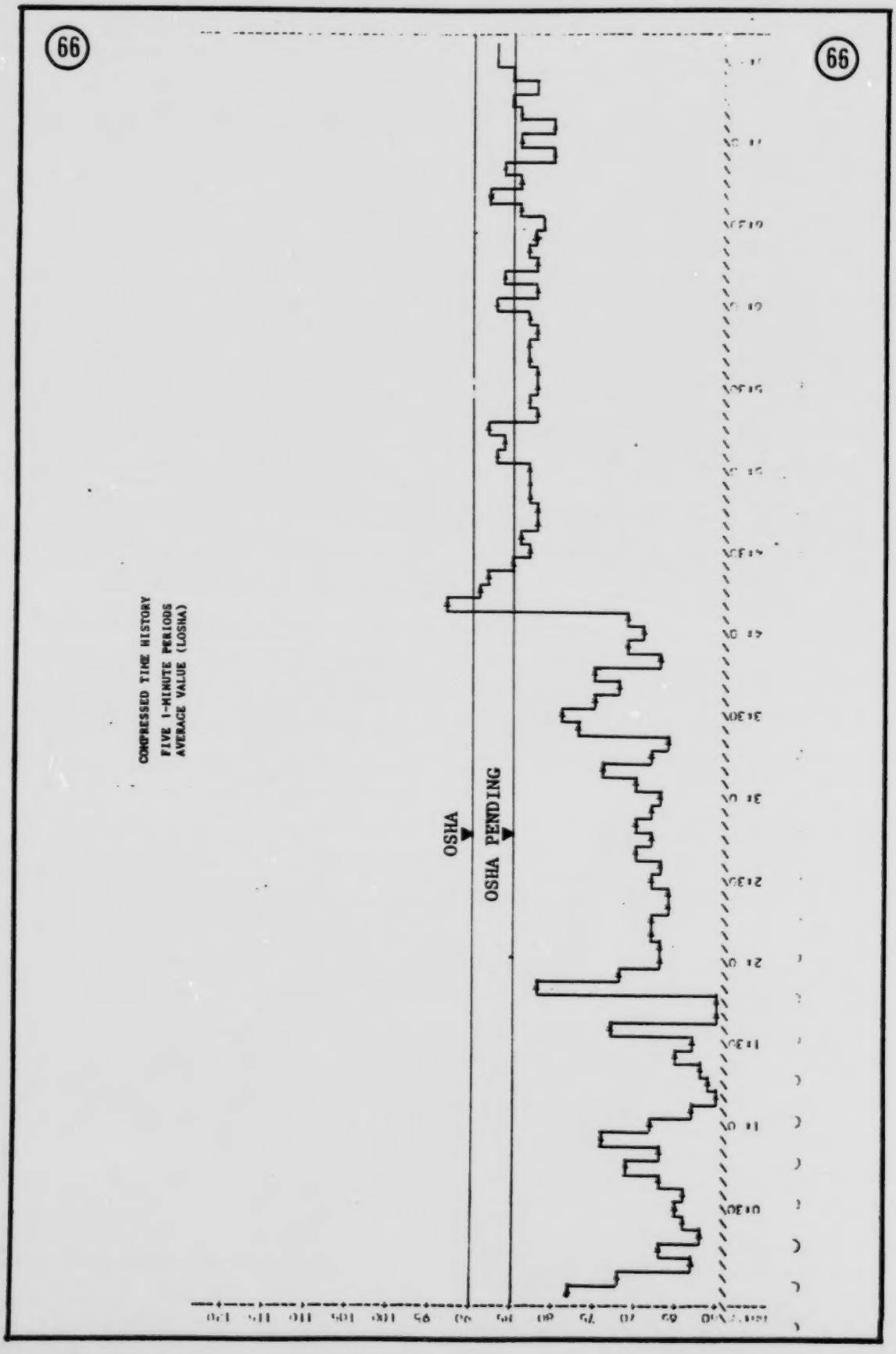
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ABS. BASELINE = 60.00 DB
100% DOSE = 7.5 HRS
EACHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 457
PERIOD = 1 MINUTES

TIME HOUR	LOCAL CUMULATIVE		CUMULATIVE	
1	64.7	64.7	.49	.49
2	64.1	64.7	.51	1.00
3	64.1	64.1	.47	1.48
4	63.0	64.3	1.1	2.56
5	64.9	64.4	1.1	3.65
6	64.1	64.4	1.1	4.73
7	64.2	64.4	1.1	5.81
8	64.2	64.4	1.1	6.89

AVG. COMP. = 60 DB
MAX. COMP. = 75 DB
MIN. COMP. = 60 DB
DOSE = 1.3 %
VALIDATION = 1.00

(66) (66)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
132	27.5	60 TO 64
54	11.3	65 TO 69
56	11.7	70 TO 74
26	5.4	75 TO 79
140	29.2	80 TO 84
62	12.9	85 TO 89
9	1.9	90 TO 94
1	0.2	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


66
66
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(67)

(67)

```
C   PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
      1   26   80   1225     60     64      4      1
        25019      112874   470
C     89  88  91  99  95  90  95  91  87  83  85  84  82  75  80  84
      96  94  94  85  84  84  83  85  92  92  94  92  83  91  87  83
      84  84  83  84  83  83  83  84  92  92  94  92  83  91  87  83
C     83  84  83  83  82  84  84  84  84  83  85  83  82  81  81  81
      84  82  85  85  86  83  83  84  84  83  89  90  88  85  87  90
      91  83  83  84  89  92  93  94  84  83  84  83  83  84  84  84
C     83  83  83  85  85  84  84  83  83  83  83  83  84  85  84  83
      83  83  83  83  84  87  92  93  87  87  84  86  86  92  83  82
      82  82  82  85  83  83  83  83  83  82  82  83  84  83  84  83
C     82  85  83  84  92  93  89  90  84  82  82  86  86  86  82  83
      84  82  83  82  82  82  86  96  87  86  94  84  86  81  85  86
      84  86  83  82  82  81  81  81  84  83  82  84  85  84  82  81
C     82  82  82  82  91  91  92  90  86  83  90  90  83  82  82  82
      82  82  83  82  82  83  82  81  82  82  82  81  80  81  81  81
      80  81  81  82  82  81  83  85  84  83  86  84  83  83  82  82
C     84  82  82  83  82  82  82  82  82  84  87  83  82  82  82  85
      84  82  81  84  84  81  84  86  81  85  87  86  86  86  85  85
      93  90  84  79  74  67  64  60  64  72  60  60  71  60  81  73
C     60  66  69  66  61  68  72  61  70  68  71  70  66  61  69  67
      60  70  62  60  70  60  60  69  67  60  71  74  61  76  76  61
      70  60  61  71  60  72  77  78  77  72  82  70  70  61  67  71
C     82  69  71  62  69  75  81  71  60  61  74  60  62  70  60  61
      81  83  83  73  81  64  70  64  65  74  66  84  78  69  74  76
      74  73  80  75  74  82  76  74  79  74  72  74  79  75  76  61
C     75  81  74  80  78  80  77  76  66  76  61  67  71  82  82  76
      68  82  75  71  63  71  81  65  71  71  69  74  69  72  72  85
      75  83  72  75  77  76  83  90  93  90  80  77  78  80  81  85
C     82  81  77  62  64  71  64  63  70  60  71  60  81  71  60  61
      71  80  61  71  60  62  70  60  65  66  76  70  60  60  60  68
      66  79  82  83  81  86  60  60  60  60  60  60  60  60  60  60
    &EOF


  ENTER LOG DATE (DD/MO/YR) : 04/07/79
  ENTER SITE CODE (5 CHARS) : SH20I
  ENTER USER CODE (4 CHARS) : 0536
   ENTER JOB CODE (3 CHARS) : 100

C
C     DATA LOGGED : 4 JULY 1979          DATA ANALYZED : 11 SEPT 1979
          LOGGER : 38-30128                   SITE CODE : SH20I
  SERIAL NUMBER : 1225                        JOB CODE : 100
C        BASELINE : 60 DB                   USER CODE : 0536
  DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
  SAMPLING RATE : 470/C                   TOTAL SAMPLES : 112874
C  TEST DURATION : 240.14                  START TIME : 1444:14

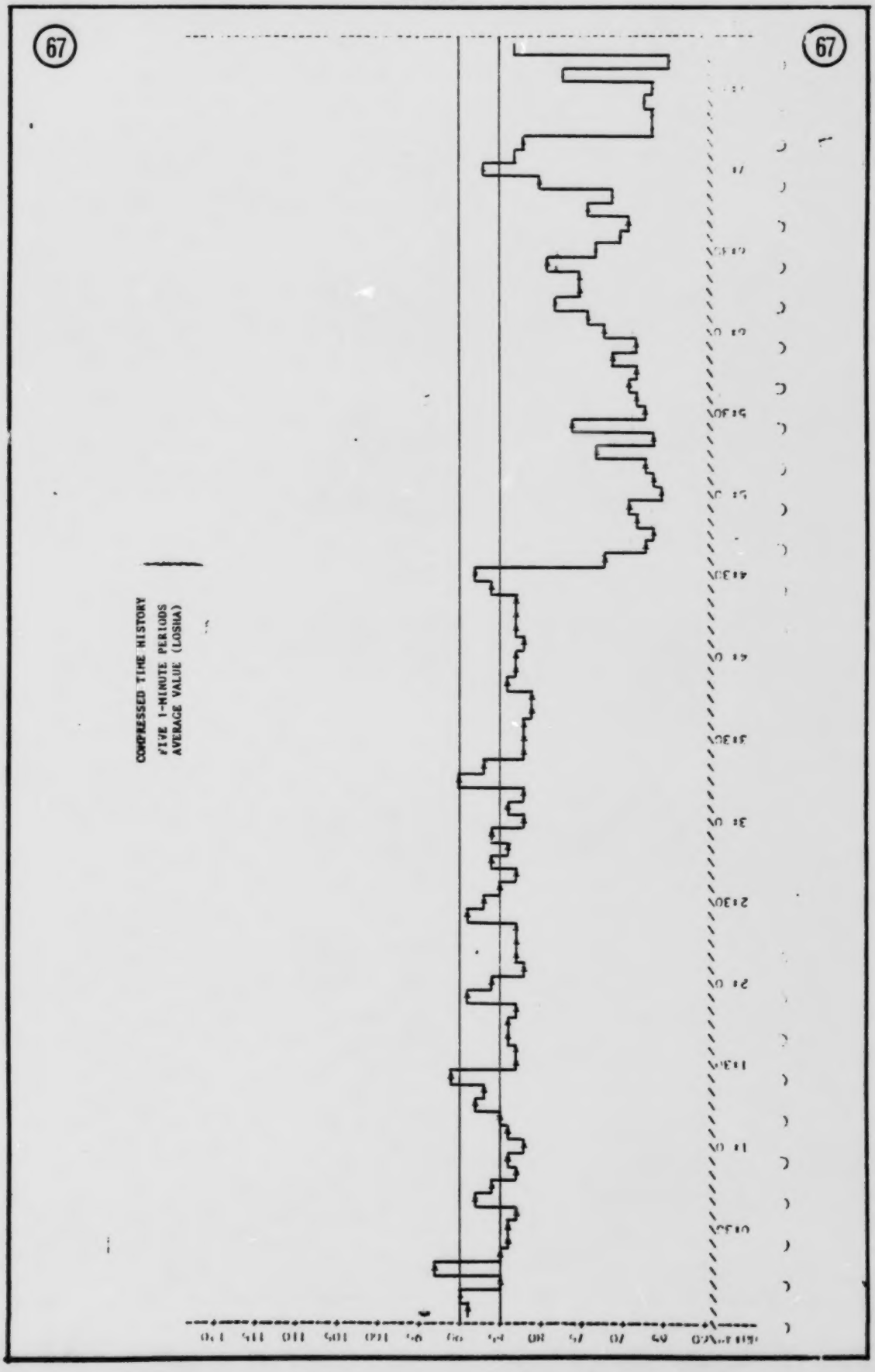
C                 TIME HISTORY ANALYSIS

      NOISE CALCULATED LINEAR (L.I.N.) CALCULATIONS
      NOISE ABOVE THE BASELINE
      DATA TYPE = 20 BIT / 4 BYTE
      CALCULATED (DEFAULT) DATE = 5 MS
C     THRESHOLD (CUTOFF) LEVEL = 60 DB
        NUMBER OF CUMULATIONS = 470
      PERIOD = 1 SECONDS
C

  BIN          LOGA                        ANTI
  NUMBER   CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
C      1      47.0       47.0          1.064      1.06
       2      35.8       82.8          8.499     19.56
C      3      14.9       97.8          8.167     27.72
       4       3.4      101.2          9.324     37.04
       5       1.2      102.4          3.109     40.15
       6       2.4      104.7           .714     40.87
       7       1.5      106.2          1.446      42.32
       8       0.9      107.1          2.119      44.44
C   TOTAL COUNTS = 60 DB              MAX. COUNTS = 9[illegible]
      [illegible]
      [illegible]
      [illegible]
```

(67) (67)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
73	15.2	60 TO 64
28	5.8	65 TO 69
52	10.8	70 TO 74
31	6.5	75 TO 79
201	41.9	80 TO 84
62	12.9	85 TO 89
30	6.3	90 TO 94
3	0.6	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


67
67
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(68)

```
 1  26  80  1225    60    64     4     1
      978      115200   480
 61  61  60  60  60  64  60  61  65  65  61  63  60  63  79  78
 77  75  84  94  91  88  86  86  84  82  84  83  83  81  82  83
 81  80  81  81  87  90  91  90  81  79  78  85  84  84  84  81
 84  81  78  87  80  82  80  81  85  82  82  81  82  83  80  82
 83  80  83  80  80  82  83  83  94  93  92  80  80  80  80  80
 [illegible]
 77  81  81  85  64  73  70  67  62  64  64  73  [illegible]
 90  83  81  82  82  80  80  82  81  82  81  81  82  84  81  81
 81  81  82  82  82  81  81  81  81  81  81  81  72  60  60  62
 [illegible]
 60  60  60  72  62  65  60  60  70  62  66  73  78  90  92  92
 83  67  74  65  77  64  60  61  60  69  66  69  60  70  74  74
 73  63  71  72  66  60  62  60  87  86  83  83  84  67  70  75
 91  87  86  88  87  88  79  62  62  63  87  61  61  60  60  60
 60  60  60  60  60  75  90  77  67  71  75  77  73  78  78  76
 78  74  84  89  82  84  90  90  86  81  81  80  71  65  75  70
 65  64  79  81  81  81  81  81  82  81  77  88  90  89  90  89
 72  72  63  71  67  67  70  60  60  60  60  60  60  60  60  62
 64  60  60  64  67  63  66  70  71  67  72  66  60  71  75  66
 60  60  60  68  63  66  61  60  77  60  60  60  60  60  60  60
 60  60  60  65  72  70  68  61  66  60  70  62  64  60  60  60
 60  68  65  69  60  63  60  83  88  92  93  77  66  65  72  72
 69  70  60  64  69  64  60  60  60  72  65  66  67  66  69  70
 68  72  67  64  60  60  60  60  60  60  60  66  61  62  67  68
 63  60  60  60  60  60  67  63  61  66  61  64  60  60  60  60
 60  60  68  61  62  60  60  62  64  67  60  60  60  63  61  60
 60  60  60  60  73  63  63  60  66  60  63  67  81  88  79  68
 65  73  68  69  62  76  60  69  65  74  60  68  70  60  76  69
 70  60  60  71  70  60  60  60  60  60  61  68  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
$EOF
```

(68)

```
ENTER LOG DATE (DD/MM/YR) : 27/08/79
ENTER SITE CODE (5 CHARS) : 1SHA0
ENTER USER CODE (4 CHARS) : 4304
 ENTER JOB CODE (3 CHARS) : 100
```

```
   DATA LOGGED :27  AUG 1979
        LOGGER : DB-301/26
 SERIAL NUMBER : 1225
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
 SAMPLING RATE :  4/SEC
 TEST DURATION =  [illegible]

DATA ANALYZED : 26 SEPT 1979
    SITE CODE : 1SHA0
      JOB CODE : 100
    USER CODE : 4304
   THRESHOLD : [illegible]
TOTAL SAMPLES =  115200
 STANDBY TIME =  [illegible]
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE ASSUMED FOR FOLLOWING
[illegible]
[illegible]
[illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOCAL		[illegible]	
[illegible]	[illegible]	CUMULATIVE	[illegible]	CUMULATIVE
1	62.4	62.4	4.378	4.38
2	82.6	82.5	4.464	8.84
3	78.2	81.3	2.421	11.2
4	68.3	81.7	2.449	13.7
5	79.5	80.5	2.938	16.62
6	73.5	79.7	1.261	17.95
7	63.1	78.7	.325	18.27
8	82.9	79.0	.529	18.56

MIN. COMP. = 60 DB MAX. COMP. = 96 DB
ARITHMETIC MEAN = 70 DB
STD. DEVIATION = 10 DB
VARIANCE =100 DB

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION

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64	13.3	65 TO 69
49	10.2	70 TO 74
36	7.5	75 TO 79
95	19.8	80 TO 84
25	5.2	85 TO 89
22	4.6	90 TO 94
0	0.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

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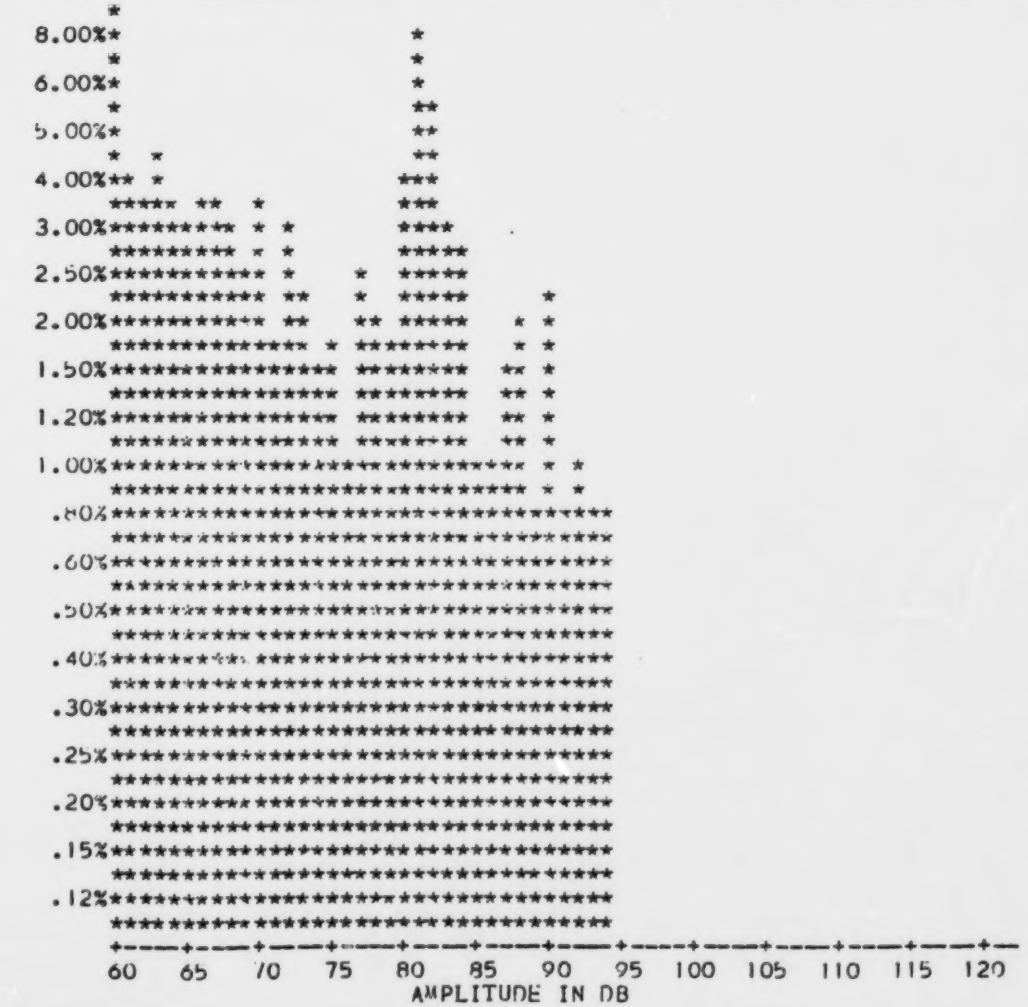

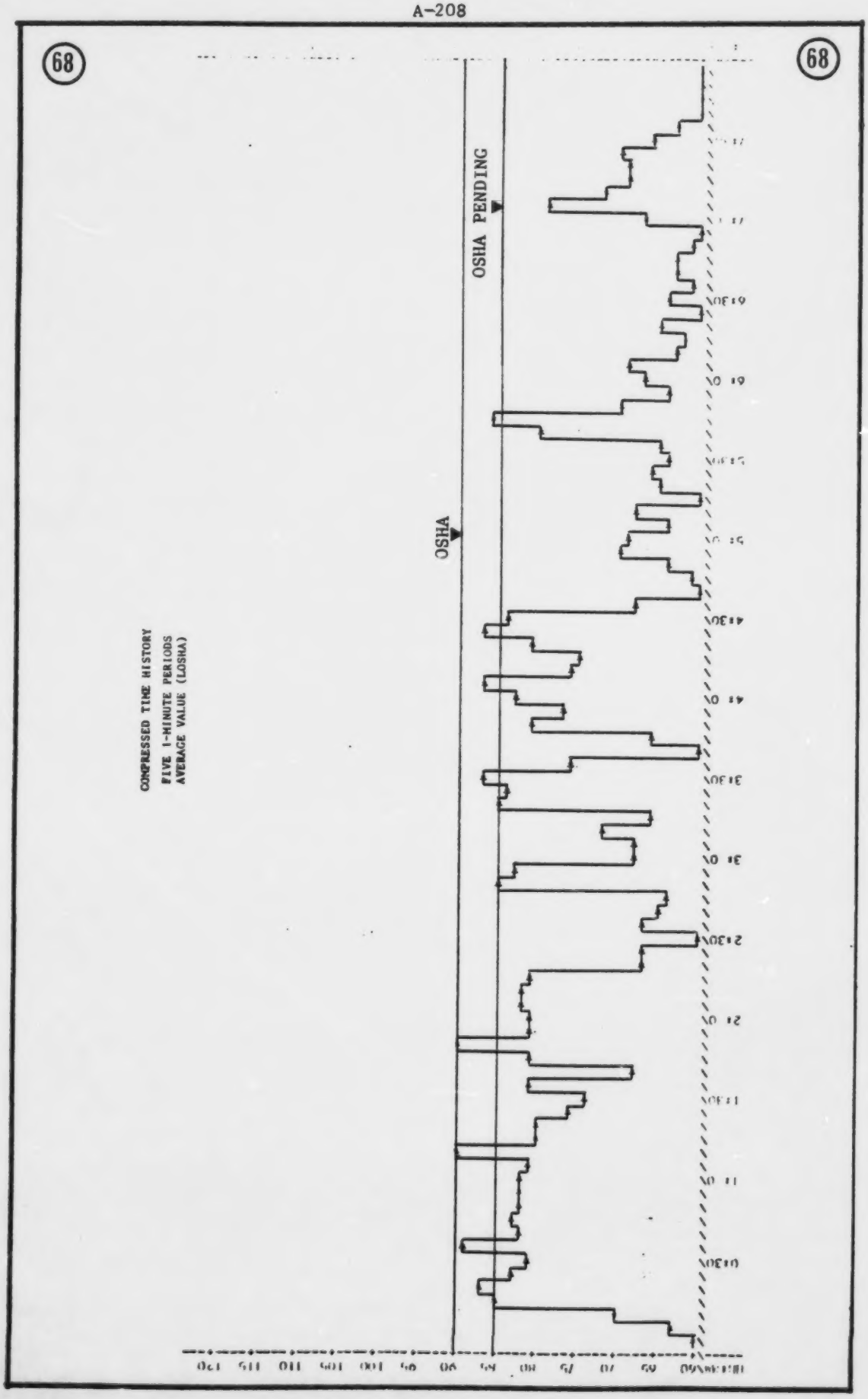
68
68
OSHA PENDING
OSHA
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

82-143 M.U. Savich

Measurement of noise exposure index of operators on haulage equipment from the underground operations at Denison Mines Ltd. in Elliot Lake

1982

MESURE DE L'INDICE D'EXPOSITION AU BRUIT DES OPÉRATEURS DE MATÉRIEL DE ROULAGE DANS LES ACTIVITÉS D'EXPLOITATION SOUTERRAINE DE LA DENISON MINES LTD. À ELLIOT LAKE

M.U. Savich*

RÉSUMÉ

On a effectué quarante mesures relatives à des opérateurs de matériel de roulage. Trois mesures ont été rejetées parce que les opérateurs n'ont pas porté leur dosimètre pendant une période assez longue. D'après les mesures, il est évident que pour les opérateurs de wagons à godets, les opérateurs de "J.D.T.", les conducteurs de camions et les opérateurs de bouteurs le L_{OSHA} est compris entre 96,2 dBA et 97,9 dBA. Seuls les opérateurs de camions Dux et les opérateurs de véhicules de service sont exposés à des niveaux de bruit inférieurs, compris entre 90,4 dBA et 92,5 dBA. Tous les opérateurs de matériel de roulage devraient porter des serre-tête antibruit. Il est recommandé de porter en même temps des serre-tête antibruit et des bouchons d'oreilles.

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*Chercheur scientifique, Laboratoire d'Elliot Lake, CANMET, Énergie, Mines et Ressources Canada, Elliot Lake (Ontario).

MEASUREMENT OF NOISE EXPOSURE INDEX OF OPERATORS ON HAULAGE EQUIPMENT FROM THE UNDERGROUND OPERATIONS AT DENISON MINES LTD. IN ELLIOT LAKE

by

M.U. Savich*

ABSTRACT

Forty measurements were taken of the haulage operators. Three measurements were rejected because workers wore their dosimeters for too short a time. From the measurements it is evident that scooptram operators, J.D.T. operators, truck drivers and bulldozer operators have L_{OSHA} between 96.2 dBA to 97.9 dBA. Only the Dux truck operators and utility vehicle operators are exposed to lower noise level from 90.4 dBA to 92.5 dBA. All operators in the haulage should be wearing ear muffs. Ear muffs in combination with ear plugs are recommended.

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* Research Scientist, Elliot Lake Laboratory, CANMET, Energy, Mines and Resources Canada, Elliot Lake, Ontario.

INTRODUCTION

To evaluate vehicle operator exposure to noise, we need to classify underground mining equipment in terms of operator noise exposure. Ranking of the noisiest machines starts with Load-Haul-Dump (LHD) machines, followed by bulldozers, service trucks, tractors, etc.

From our field measurements of Noise Exposure Index (NEI), we estimated that one third of all miners are exposed to the noise from diesel powered machines, including operators and bystanders Basic measurement of NEI was performed on 40 workers (see Appendices 1-40). Three measurements were rejected, measurements No. 5, 16 and 17, because the workers wore their dosimeters for too short a time. Readings were taken near the operators ear.

OPERATOR EXPOSURE

Data was obtained by profiling dosimeter measurements and was supplemented with information obtained from interviews with mine personnel. Table 1 summarizes the resulting log average of L_{OSHA} and the mean values and standard deviations of the average working time (min/dBA).

In Table 1 is shown the resulting rank ordering of operator on the basis of the haulage machine type in use. As is evident from this table, scooptram operators, J.D.T. operators, truck drivers and bulldozer operators have L_{OSHA} between 96.2 dBA to 97.9 dBA. Only Dux truck operators and utility truck operators are exposed to lower noise levels from 90.4 dBA to 92.5 dBA.

All operators are over-exposed.

CONCLUSION

Table 1 has been developed to apply to representative time-average noise levels to which the operators are exposed during working operations,

Table 1 - Results of L_{OSHA} and time during work day

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
1	2755	283	Scooptram Op.	480	101.4	18	18	17	16	20	14	64	37	124	151	1	0	480	CC201
2	4186	270	Scooptram Op.	465	85.4	217	53	48	39	18	17	33	41	14	0	0	0	480	CC201
3	7366	283	Scooptram Op.	480	98.1	88	18	10	6	27	43	30	35	213	10	0	0	480	CC201
4	4189	ST-5	ST-5 Operator	480	95.8	61	21	11	23	112	46	67	43	43	51	2	0	480	00307
5*	7791	SCT	Scooptram Op.	350	96.1	199	20	13	7	10	43	41	48	78	21	0	0	480	00308
6	7862	283	Scooptram Op.	480	97.3	65	18	2	6	15	32	43	126	167	6	0	0	480	00310
7	2568	283	Scooptram Op.	480	93	25	10	6	4	1	191	141	51	48	3	0	0	480	CC210
8	2568	283	Scooptram Op.	480	97.8	23	9	8	3	20	105	69	49	174	20	0	0	480	CC210
9	4110	284	Equipment Op.	480	103.8	24	8	14	7	5	2	44	54	79	230	13	0	480	CC210
10	7914	283	Scooptram Op.	480	100.8	8	6	18	24	5	10	49	70	236	54	0	0	480	30289
11	1579	283	Scooptram Op.	480	93.2	77	8	24	18	22	42	76	212	1	0	0	0	480	30PAN
12	2817	283	Scooptram Op.	478	96.5	95	24	20	20	14	15	75	66	133	18	0	0	480	30PAN
13	7827	CTI	Scooptram Op.	480	92.1	164	35	30	20	42	29	38	37	85	0	0	0	480	1SHAF
14	4272	ST-5	ST-5 Operator	480	94.8	124	21	13	15	16	16	84	70	119	2	0	0	480	00000
15	4561	SCH	Scooptram Help.	480	90.6	139	39	32	27	69	34	28	55	57	0	0	0	480	00000
			Mean	478.79	97.89	80.57	20.57	18.07	16.29	27.57	42.57	60.07	67.57	106.64	38.93	1.14	-	480	
			Std. Dev.	4	Log aver.	62.36	13.6	12.2	10.35	29.73	49.58	29.83	47.63	72.49	68.43	3.46	-	479.99	
16*	0848	213	Dux Truck Op.	153	80.7	353	28	24	25	16	24	9	1	0	0	0	0	480	00307
17*	4199	213	Dux Truck Op.	161	68.9	443	9	4	14	9	1	0	0	0	0	0	0	480	00307
18	4199	213	Dux Truck Op.	480	91	162	23	20	34	24	46	70	42	57	2	0	0	480	00307
19	4277	213	Dux Truck Op.	480	86.6	182	39	34	27	35	57	48	49	6	3	0	0	480	00307
20	4806	DUX	Dux Truck Op.	480	91.9	57	19	14	31	70	56	79	138	16	0	0	0	480	00000
21	4754	211	Dux Truck Helper	480	91	51	28	41	32	69	55	73	112	19	0	0	0	480	1SHAF
22	7519	230	J.U.T. Truck Op.	480	89.5	185	15	19	34	29	45	46	84	23	0	0	0	480	CC201
			Mean	480	90.35	127.4	24.8	25.6	31.6	45.4	51.8	63.2	85	24.2	1	-	-	480	
			Std. Dev.	-	Log aver.	67.62	9.28	11.37	2.88	22.35	5.81	15.16	40.88	19.38	1.41	-	-	480	

* Not estimated

Cont. overleaf

Table 1 - cont.

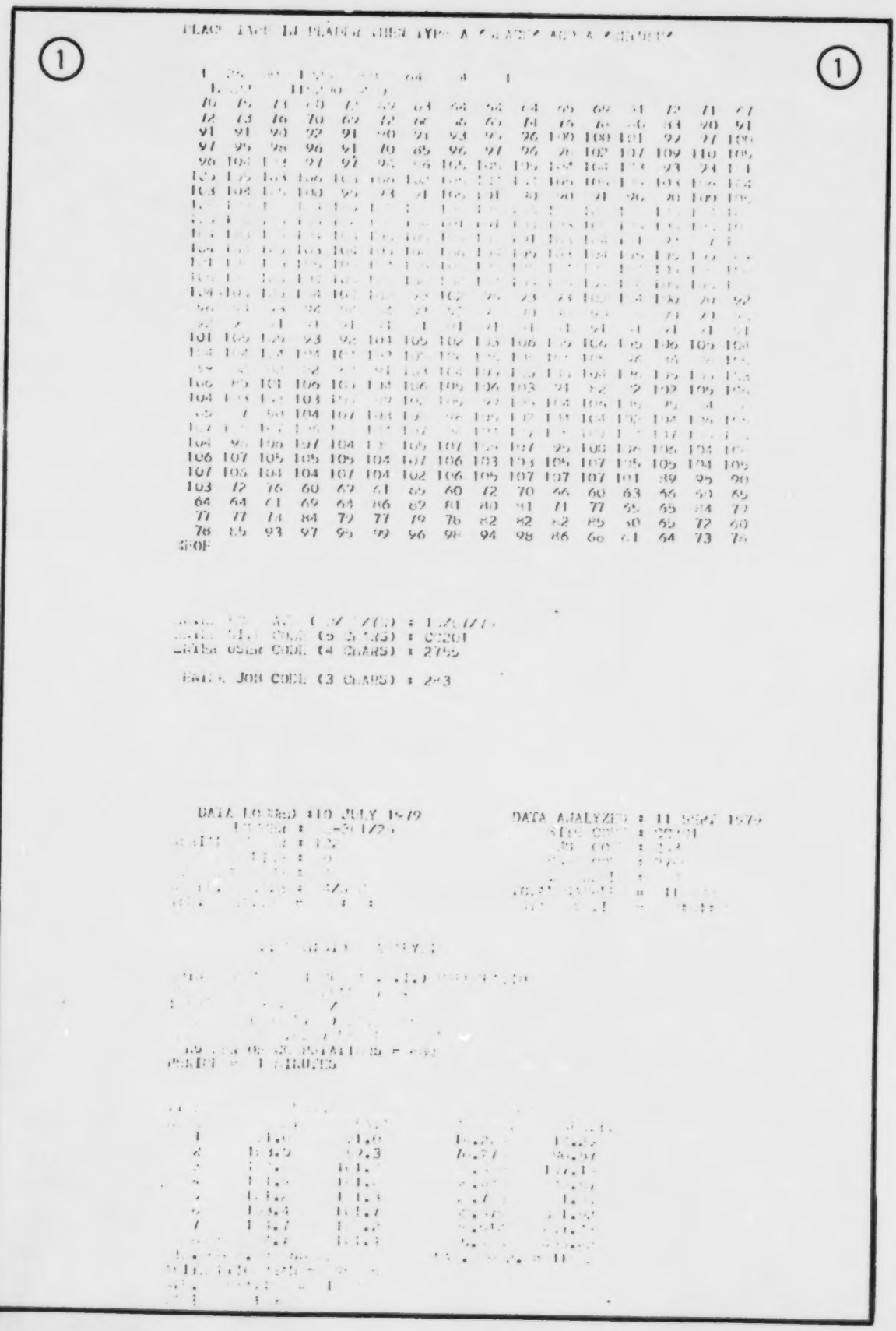
No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
23	7929	281	Jarco Operator	480	96.6	80	41	29	28	52	52	36	37	55	70	0	0	480	00307
24	4449	271	J.D.T. Operator	480	97.5	48	22	14	10	6	33	51	119	171	6	0	0	480	CC201
25	7203	211	J.D.T. Operator	480	84.8	202	37	29	44	65	47	29	10	14	3	0	0	480	CC210
26	7384	283	J.D.T. Operator	478	96.3	51	22	9	17	21	81	90	58	111	20	0	0	480	20951
27	2481	211	J.D.T. Operator	480	100.6	44	10	16	13	6	29	54	64	99	145	0	0	480	28PAN
28	7384	283	J.D.T. Operator	480	98.4	21	11	10	5	10	56	64	119	169	15	0	0	480	30289
			Mean	479.67	97.42 ▲	74.33	23.83	17.83	19.5	26.67	49.67	54	67.83	103.17	43.17	-	-	480	
			Std. Dev.	0.82	Log aver.	65.32	12.89	9.02	14.29	25.59	18.65	21.7	43.92	62.1	55.52	-	-	480	
29	4139	214	Utility Veh. Op.	480	94.1	154	59	59	28	46	24	29	30	17	9	25	0	480	00307
30	4122	213	Utility Veh. Op.	480	85.9	317	33	31	9	12	32	17	9	11	5	4	0	480	CC230
31	4561	214	Utility Veh. Op.	480	93.8	93	15	14	20	36	53	104	96	26	23	0	0	480	SHAFI
			Mean	480	92.52 ▲	188	35.67	34.67	19	31.33	36.33	50	45	18	12.33	9.67	-	480	
			Std. Dev.	-	Log aver.	115.81	22.12	22.72	9.54	17.47	14.98	47.15	45.4	7.55	9.45	13.43	-	480	
32	7355	211	Truck Driver	480	97.9	82	19	7	7	7	13	65	90	188	2	0	0	480	CC210
33	7355	211	Truck Driver	480	99.8	53	14	14	3	3	45	54	68	120	106	0	0	480	CC210
34	7618	TRD	Truck Driver	480	100.9	46	20	27	15	3	28	73	54	78	117	14	0	480	00000
35	7409	GEO	U/G Equip. Op.	480	91.8	124	48	18	24	31	34	48	108	45	0	0	0	480	00000
36	2614	211	Equip. Operator	480	91	53	14	19	36	79	87	82	89	19	2	0	0	480	CC210
			Mean	480	97.89 ▲	71.60	23	17	17	25.6	41.4	64.4	81.8	90	45.40	2.8	-	480	
			Std. Dev.	-	Log aver.	32.41	14.25	7.31	13.32	31.81	27.99	13.79	21.03	66.55	60.47	6.26	-	480	
37	7759	212	D-6 Operator	480	98.8	89	3	6	4	47	18	34	52	197	25	5	0	480	00310
38	7953	120	D-6 Operator	480	92.9	117	34	49	17	11	6	41	162	43	0	0	0	480	30300
39*	7387	212	Operator	369	95.4	184	24	14	18	11	35	49	59	73	9	4	0	480	PAN26
40	4356	212	Grader Operator	480	94.8	35	30	20	7	10	33	69	239	36	1	0	0	480	2SHAF
			Mean	480	96.22 ▲	80.33	22.33	25	9.33	22.67	19	48	151	92	8.67	1.67	-	480	
			Std. Dev.	-	Log aver.	41.68	16.86	21.93	6.81	21.08	13.53	18.52	93.98	91	14.15	2.89	-	480	

* Not estimated

rather than to the maximum levels that may occur over short periods. This is the advantage of integrating noise dosimeters. All operators in haulage should be wearing ear muffs. For better protection ear muffs in combination with ear plugs are recommended.

APPENDIX A

MEASUREMENT OF NOISE EXPOSURE INDEX OF OPERATORS ON HAULAGE EQUIPMENT IN THE UNDERGROUND MINES WITH FULL INFORMATION: PERCENT DOSE (CURRENT AND CUMULATIVE): ARITHMETIC MEAN: STANDARD DEVIATION: VARIANCE: AMPLITUDE DISTRIBUTION (GRAPHICAL AND NUMERICAL): AND TIME HISTORY (GRAPHICAL).



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16	3.3	75 To 79
20	4.2	80 To 84
14	2.9	85 To 89
64	13.3	90 To 94
37	7.7	95 To 99
124	25.8	100 To 104
151	31.5	105 To 109
1	.2	110 To 114
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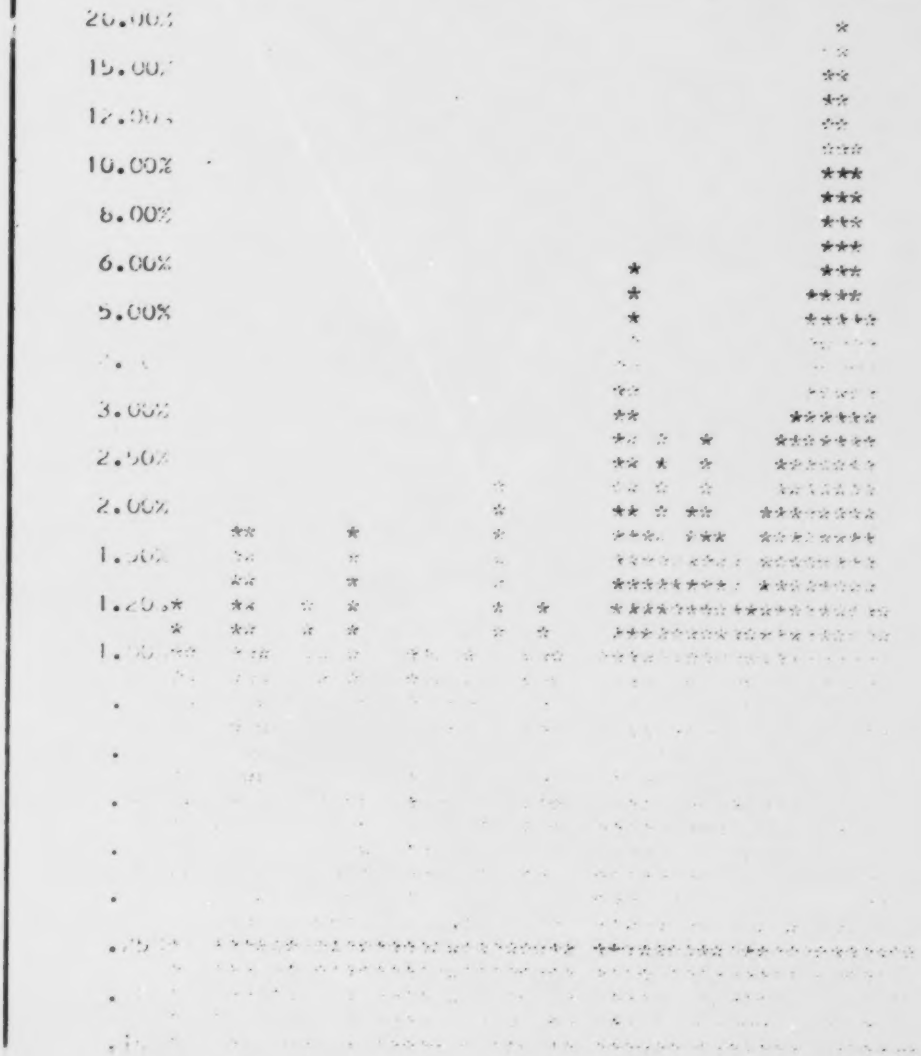

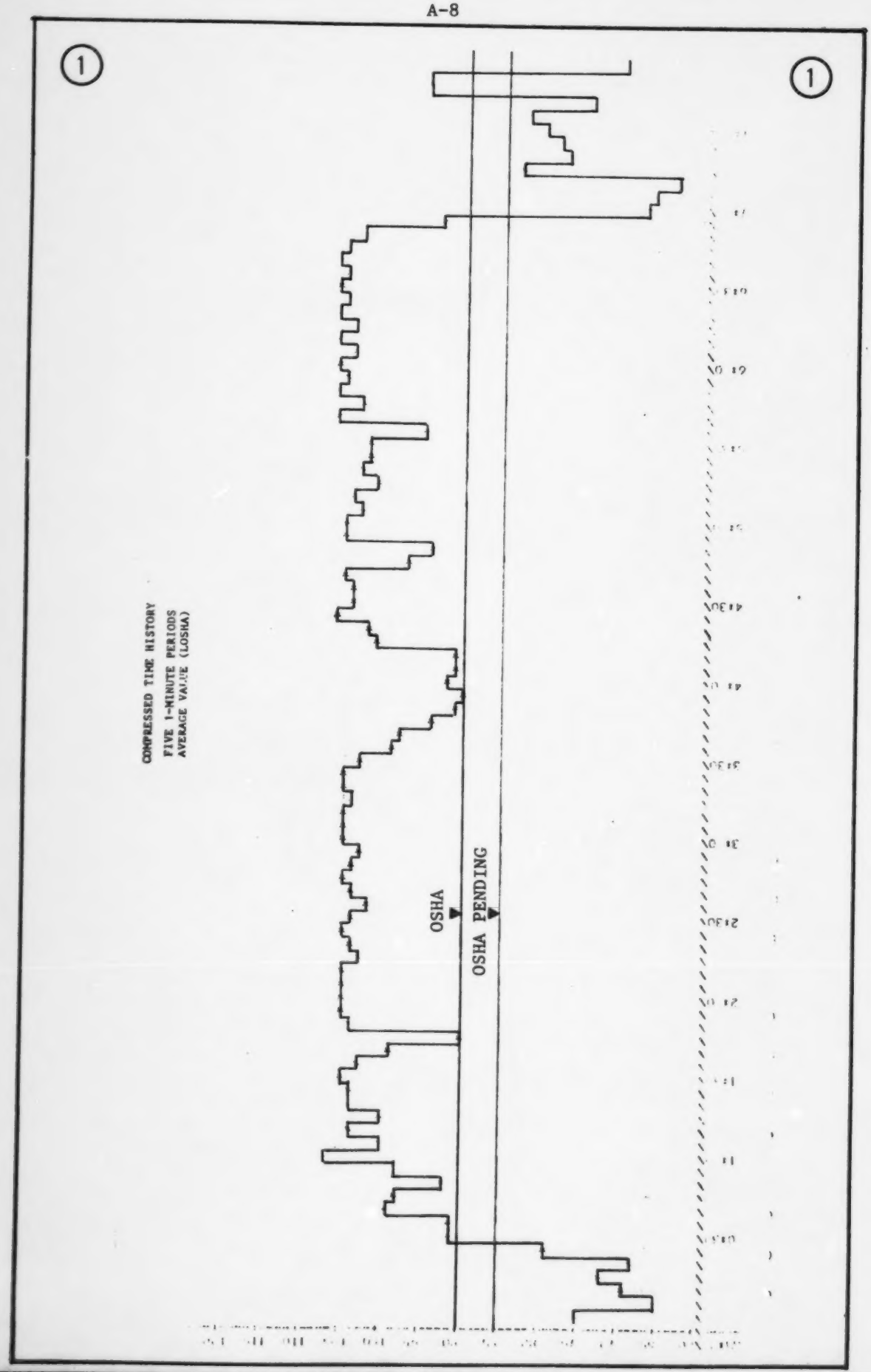
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1
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(2)

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(2)

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 94  92  92  92  91  91  91  93  92  98  97 102 100  98  96 101
102 103 100  98  96  98  97  96  92  89  90  86  74  60  64  64
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AMPLITUDE DISTRIBUTION

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48	10.0	70 To 74
39	8.1	75 To 79
18	3.8	80 To 84
17	3.5	85 To 89
33	6.9	90 To 94
41	8.5	95 To 99
14	2.9	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119
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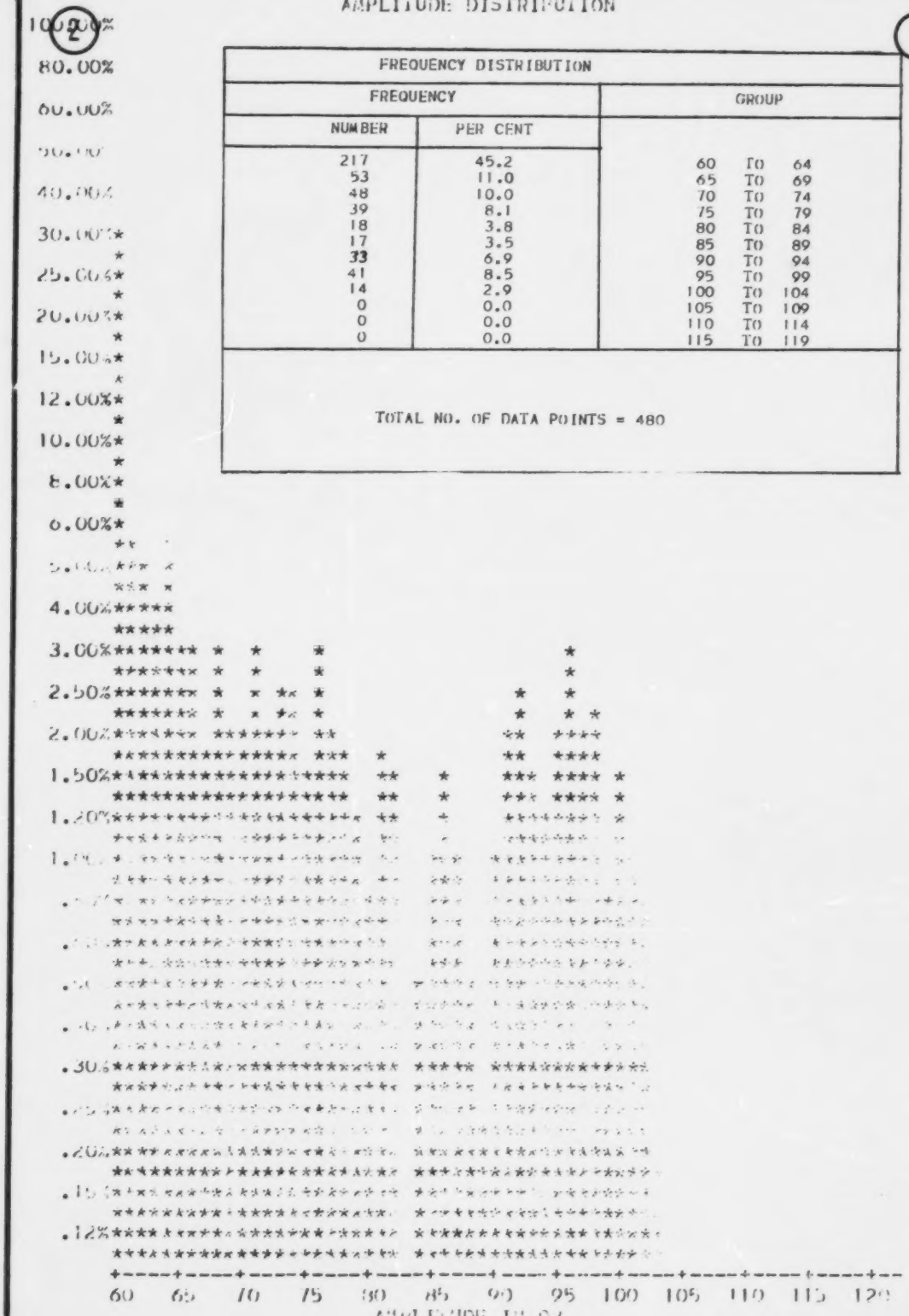

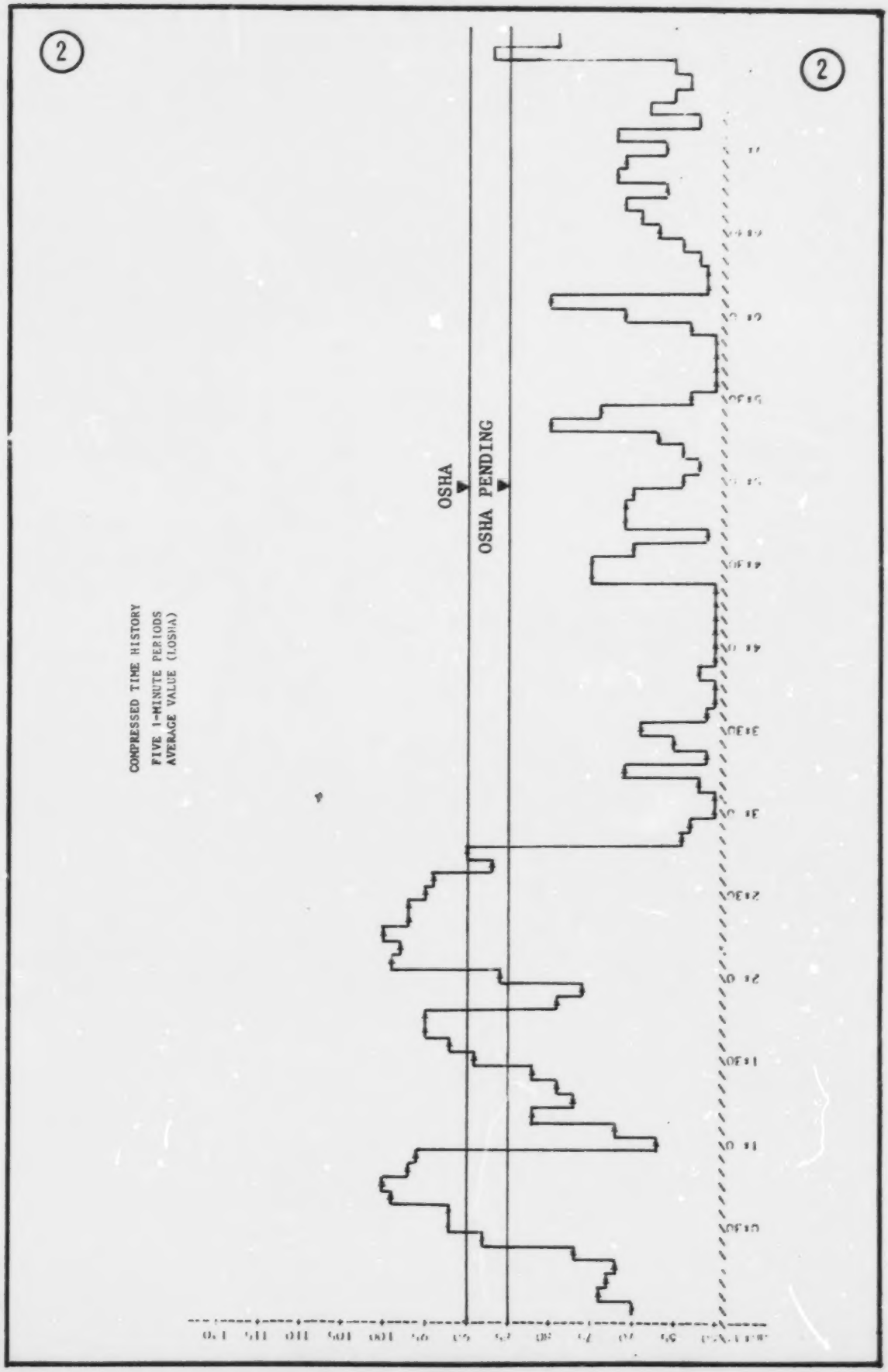
2
2
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(3)

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 97  99  99  98  99 100  99  95  91  89  87  82  99  87  94  88
 90  93  90  97 101 102  97  89  93  87  90  88   6  96  91  91
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104 102  91  88 102 103 101 103 102 102 103 103 102  99 105 102
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 93  88  94  99 102 100 104 103 105 104 104 103 102 103 105 106
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102  85  63  60  66  86  72  60  66  60  60  60  60  73  79  90
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 ENTER JOB CODE (3 CHARS) : 263
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DYNAMIC RANGE : 65 dB
SAMPLING RATE : 4750
TEST DURATION = 24 : 0

DATA ANALYZED : 17 SEPT 1979

JOB CODE : 263
USER CODE : 7366
CALIBRATION : 60 dB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:23

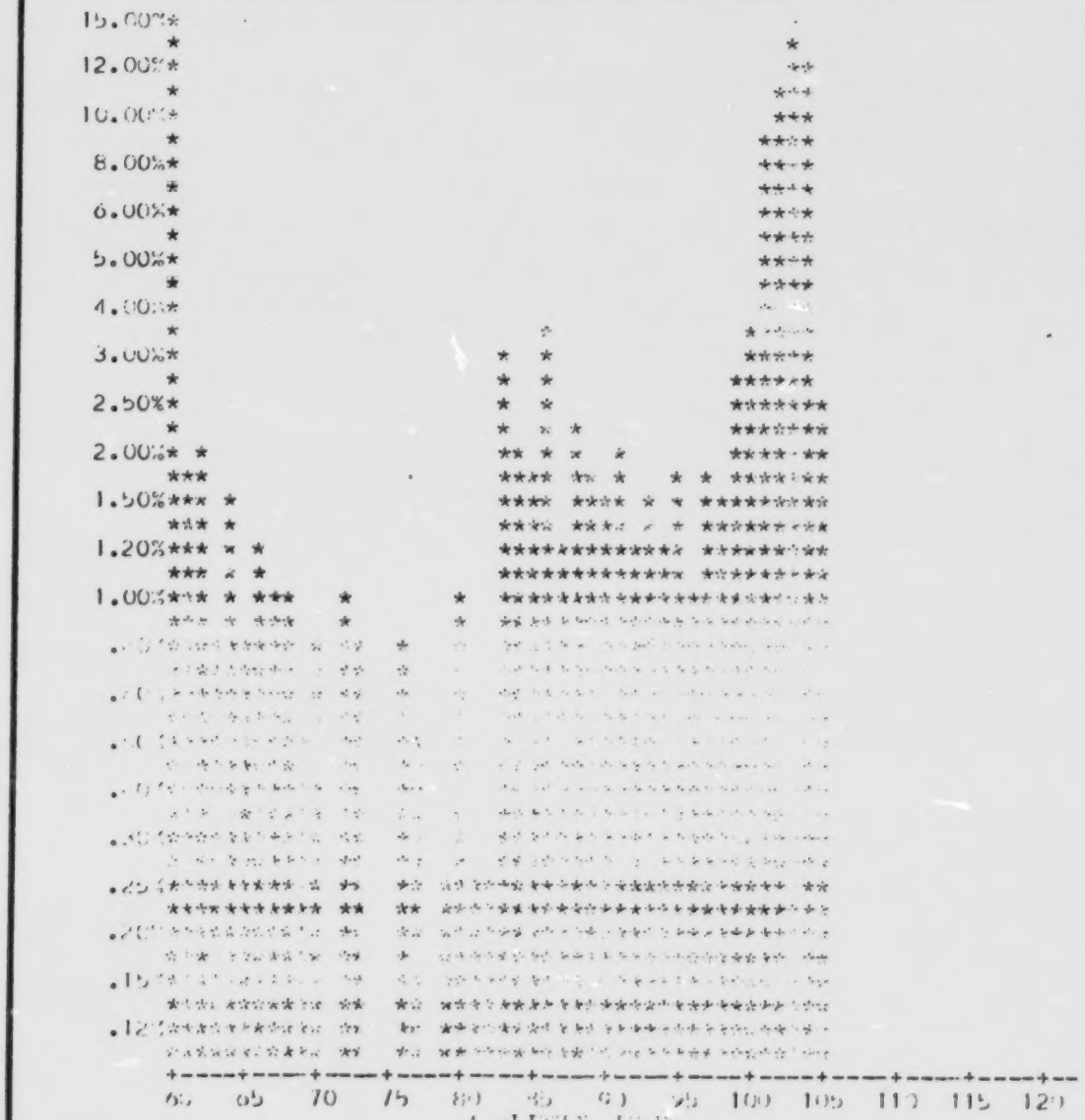
TIME HISTORY ANALYSIS

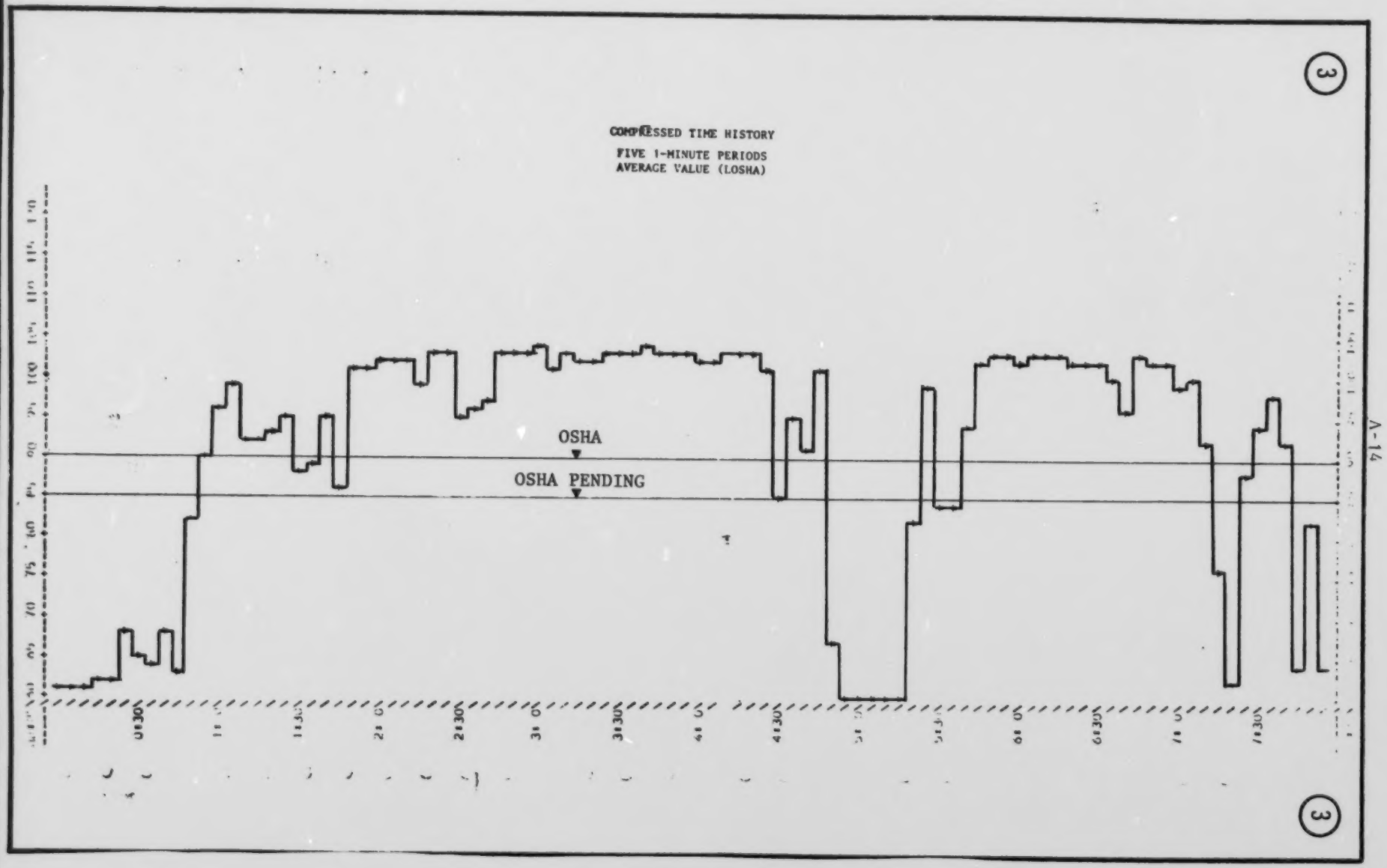
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 [7 8 dBA
EXCHANGE (DOUBLING) RATE = 5 dB
THRESHOLD (CUTOFF) LEVEL = 70 dB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LOCAL CURRENT	LOCAL CUMULATIVE	DOSE CURRENT	DOSE CUMULATIVE
1	75.7	75.7	1.731	1.73
2	99.5	90.9	26.612	28.34
3	101.2	94.1	32.252	60.59
4	102.9	96.5	45.231	105.83
5	98.3	98.5	39.313	145.15
6	91.9	94.0	24.916	226.82
7	101.9	96.7	54.953	281.77
8	92.1	98.1	16.793	308.57

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 98 DB
STD. DEVIATION = 16 DB
VARIANCE = 250 DB
MAX. COMP. = 105 DB

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
88	18.3	60 TO 64
18	3.8	65 TO 69
10	2.1	70 TO 74
6	1.3	75 TO 79
27	5.6	80 TO 84
43	9.0	85 TO 89
30	6.3	90 TO 94
35	7.3	95 TO 99
213	44.4	100 TO 104
10	2.1	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
3
3

④

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  20  40  1240   60   64    4    1
     450     11%200  440
 67  66  68  77  76  71  73  65  65  67  67  63  66  70  68  63
 66  63  61  66  75  79  79  67  81  78  77  75  79  79  76  80
 81  79  79  77  80  78  81  75  81  82  80  75  82  80  80  80
 72  60  65  68  63  61  63  73  68  69  69  62  61  60  62  60
 60  61  60  61  60  61  60  60  62  64  60  64  60  63  62  60
 60  60  61  60  66  63  64  62  62  62  61  60  60  60  60  60
 60  60  60  60  60  60  60  64  60  63  60  60  65  62  60  61
 [illegible]
 [illegible]
 94  90  93  84  73  84  83  92  85  86  87  89  82  91  91  93
 94  89  94  95  94  96  94  95  85  91  94  85  83  96  90  94
 97  94 101  95  99 101 103  94  99  83 100  98  96  99 100  97
100  88  92  94  94  99  97 100 101 101 102 100  99  95  97  92
100  86  98  96  96  99  99  98  97  93  92  96 100  96  98  90
 79  75  77  78  79  79  82  81  81  80  81  82  81  90  95 100
 94  92 101 103 101 101 101 100  99  99  97  98  99  94  87  [illegible]
 89  93  89  89  88  87  91  83  83  83  84  84  83  83  83  83
 83  83  83  83  83  83  87  84  83  83  83  83  83  83  83  83
 83  83  90  84  84  84  83  83  85  95  89  83  83  83  83  [illegible]
 83  83  83  83  83  83  83  83  83  84  83  89  96  84  95  84
 83  83  83  85  85  84  83  83  83  83  83  90  93  90  96  86
 96  85  83  83  83  83  83  84  83  83  83  83  83  83  84  85
 91  [illegible]
 89  91  86  87  99 102 105 107 102  97  97  95  94 102 105  98
102 104 103 102 105 109 108 107 105 109 106 107 107 106 102 108
107 107 102 105  91  89  91  92  90  90 104 106 104 105 107 107
108 108 107 107 107 107 102  93  93  92  96 103  98 105 109 109
106 110 109 107 105 107 107 105 104  92 103 104 101 103 107 110
102 102  94  90  91  90  90  90  89  89  90  90  90  90  93 106
107 104 104 108 109 107 107 105 106 100 106 107 107 107 107  94
%EOF
```

④

```
ENTER LOG DATE (DD/MM/YR) : 13/09/79

ENTER SITE CODE (5 CHARS) : 00307
ENTER USER CODE (4 CHARS) : 4189

 ENTER JOB CODE (3 CHARS) : ST5
```

```
   DATA LOGGED :13 SEPT 1979                DATA ANALYZED : 27 SEPT 1979
       LOG'ER : [illegible]-301/26                SITE CODE : 00307
 [illegible]                                      [illegible]
```

```
          [illegible] ANALYSIS

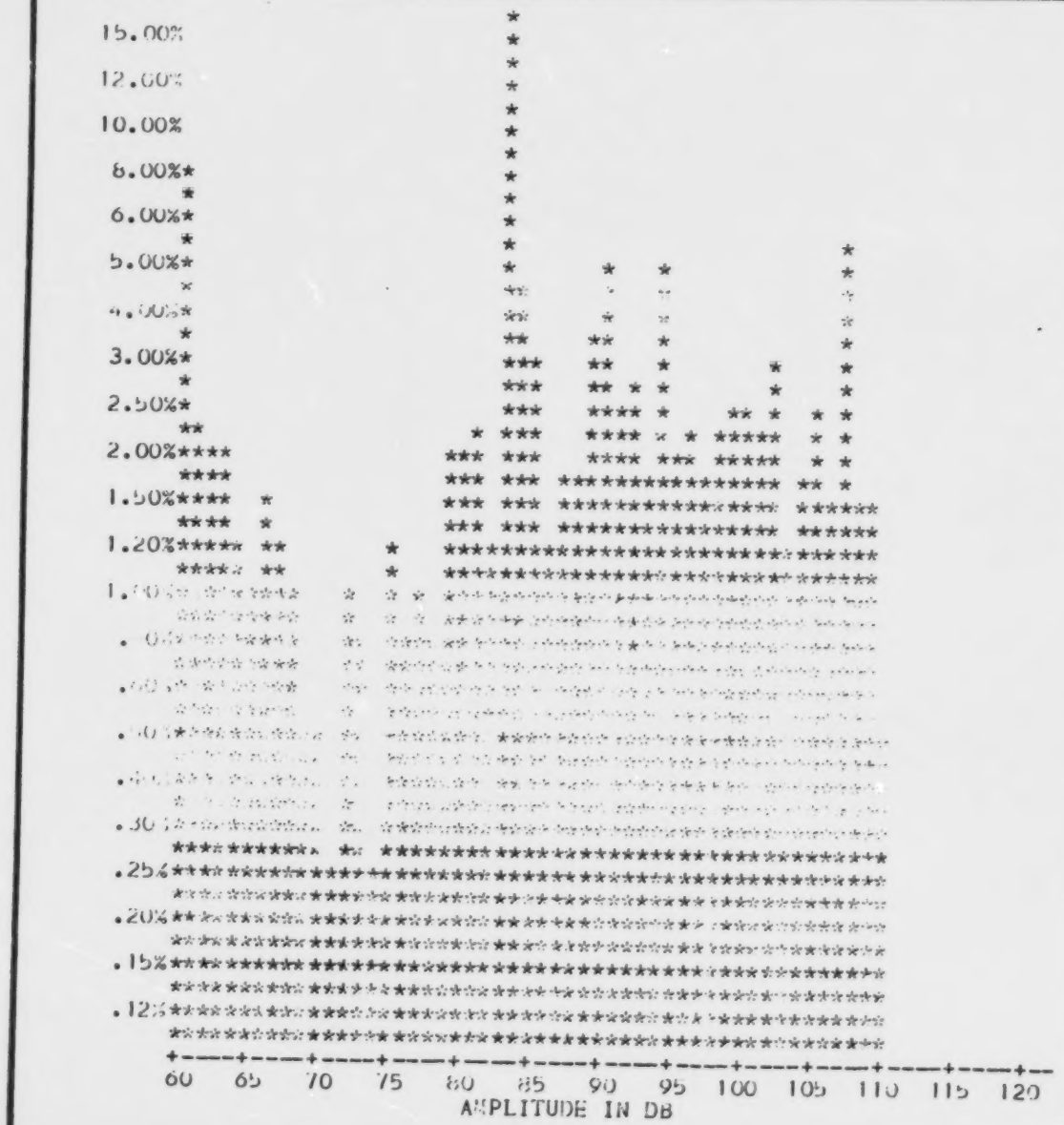
[illegible] CALCULATION
[illegible]
[illegible]
[illegible]
[illegible]
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

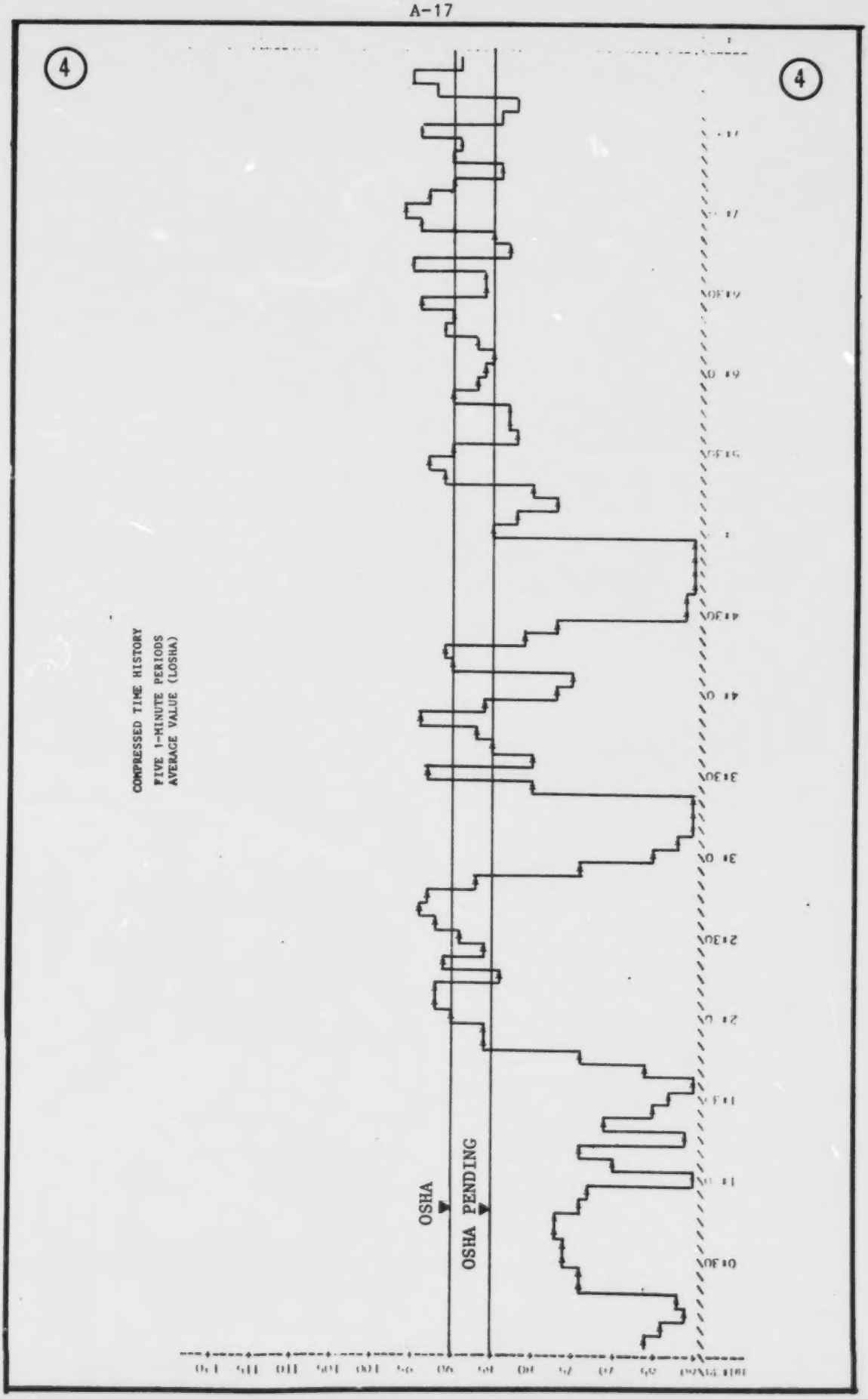
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	79.1	79.1	1.979	1.98
2	64.4	71.5	.360	1.98
4	90.7	84.7	13.718	15.69
4	95.7	84.3	27.717	43.37
5	91.6	84.6	15.527	58.89
6	85.9	89.1	7.056	65.95
7	102.8	93.4	73.434	139.39
8	103.6	99.0	84.510	224.89

[illegible] = 80 DB MAX. [illegible] = 110 DB
[illegible] = 80 DB
[illegible] = 14
[illegible]

FREQUENCY DISTRIBUTION		
FREQUENCY		[illegible]
NUMBER	PER CENT	
59	14.7	60 65 69
13	3.3	65 70 74
8	1.7	70 75 79
21	4.5	75 80 84
112	24.1	80 85 89
46	9.9	85 90 94
67	14.4	90 95 99
43	9.2	95 100 104
43	9.2	100 105 109
51	11.0	105 110 114
2	.4	110 115 119
0	0.0	

TOTAL NO. OF DATA POINTS = 465




4
4
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(5)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1216   60   64    4    1
   42190     84100  350
 63  63  61  60  73  69  66  65  63  60  60  62  64  68  60  69
 65  60  74  73  69  70  74  68  63  65  65  64  69  68  68  70
 83  69  80  86  86  90  95  96  96  88  88  92  92  92 101 100
101  85  98 102 104 101 101 106 105 105 105 107  90  62  93 102
106 100  94  92  75  60  60  83  60  60  61  60  60  60  65  60
 60  60  62  80  87  94  85  71 100 105  91  96  99 101 104 104
104 105 103 102 104 101 103 101 106 101  86  90  99  95  85  96
105 103 102 100  98 104 100 101 106 105 101 102 103 103  95 104
102  97 106 106 101  93 103  96 101 102  80  89  88  95  92  85
 86  87  87  87  87  89  85  96  92  89  98  96  91  87  86  81
 89  91  83  88 100  88  85  99  83  89  91 102  94  60  87  91
 86  95  96 101  95  93  94  93  93  92  95  90  95 100 103  96
 97  98  96  87  85  88  88  66  76  76  83 102  94  94  73  94
 99 102  97  94 103 100  60  72  95  94  94 103 105  99  95  99
 99 100  95 100 104 106  99  92  87 102 103 104 103 101 101 105
102  95  62  60  60  61  78  60  60  60  60  76  60  60  60  60
 60  72  67  60  73  78  60  76  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 83  61  74  60  87  90 100  94  96  90  90 100 102 103 101  94
100  91  66  67  83  80  80  65  61  87  71  96 102 101 102  97
 95 102 102 102 103 101  97  95  90  89  99  94 107  98  94  94
 94  95  98 100 102 101 102 102 101 101 100  95 102 102  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
*EOF*
```

(5)

```
ENTER LOG DATE (DD/MM/YR) : 15/08/79

ENTER SITE CODE (5 CHARS) : 00308
ENTER USER CODE (4 CHARS) : 7791

 ENTER JOB CODE (3 CHARS) : SCT
```

```
   DATA LOGGED #15  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 00308
SERIAL NUMBER : 1216                        JOB CODE : SCT
      BASELINE : 60 DB                     USER CODE : 7791
DYNAMIC RANGE : 64 DB                      THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  84100
TEST DURATION =  5950.25              STANDBY TIME =  2850.47

                TIME HISTORY ANALYSIS

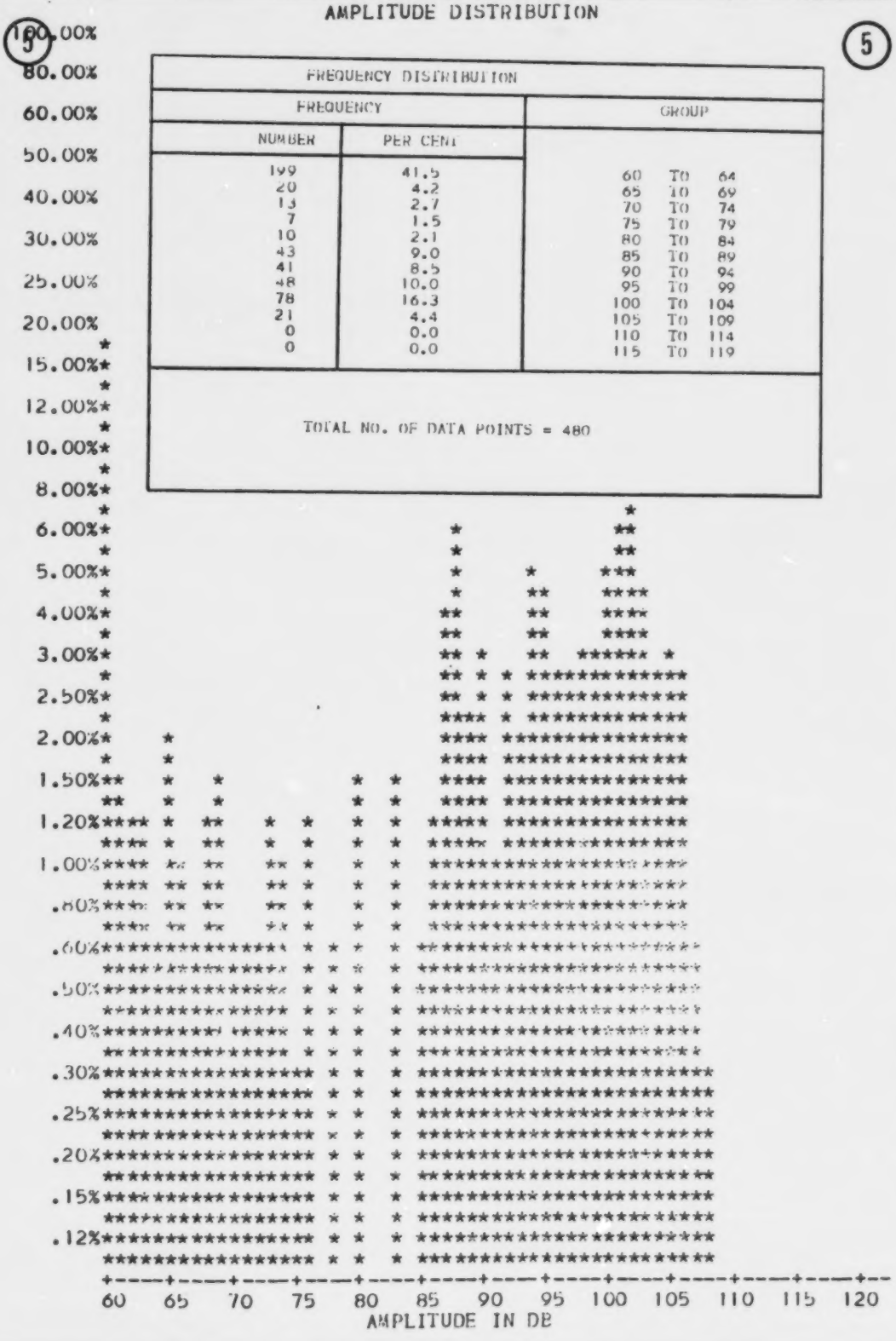
NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 350
PERIOD =  1 MINUTES

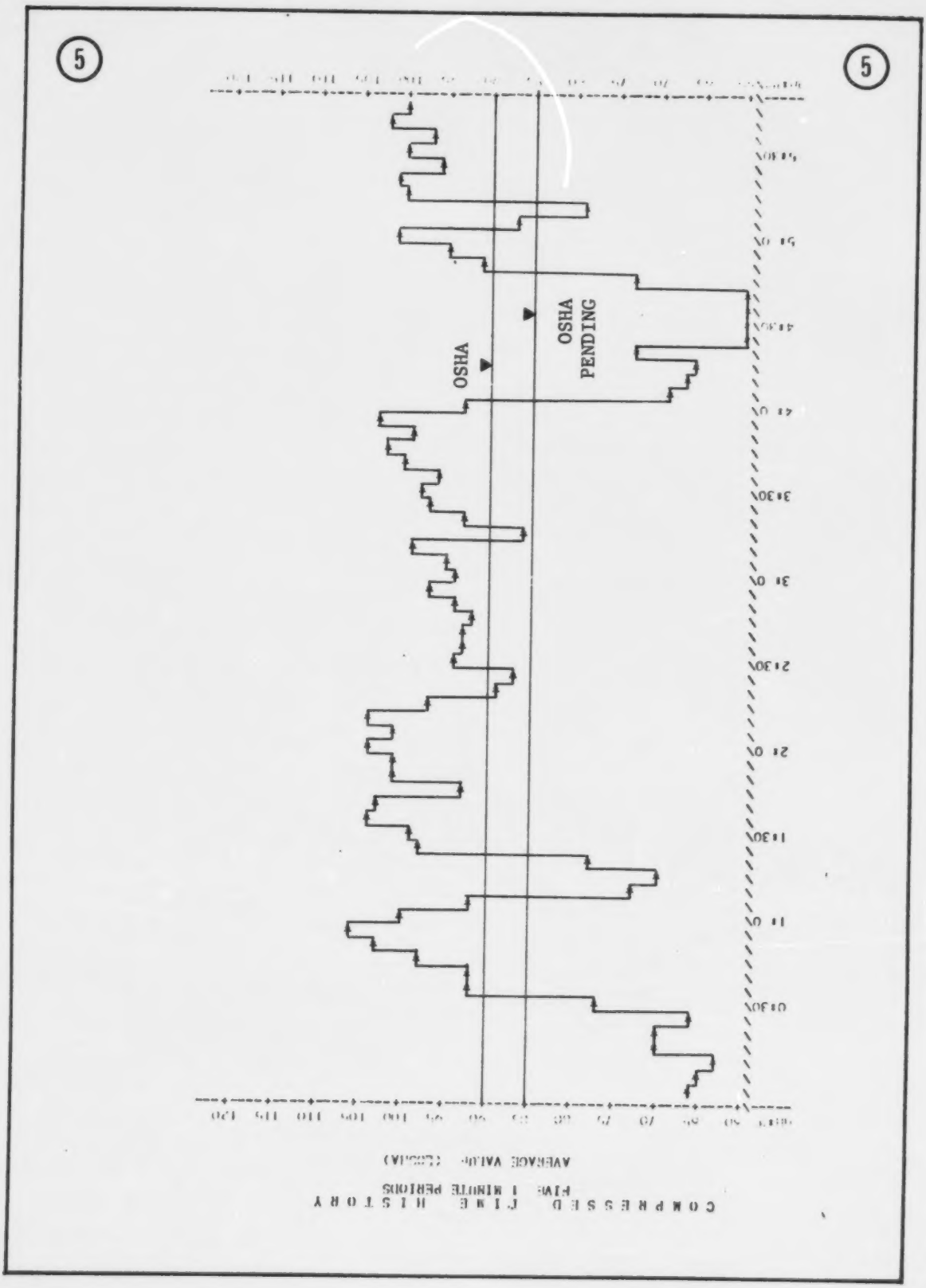
TIME          LOSHA                        %DOSE
HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1       93.9        93.9         21.565      21.56
   2       95.0        96.2         37.883      59.45
   3       97.2        96.6         34.047      93.49
   4       97.9        96.9         37.254     130.75
   5       83.7        95.6          5.208     135.96
   6       98.4        96.1         33.413     169.37
MIN. COMP. =  60 DB                MAX. COMP. = 105 DB
ARITHMETIC MEAN =  86 DB
STD. DEVIATION =  14 DB
VARIANCE =256 DB
```

AMPLITUDE DISTRIBUTION

(5)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
199	41.5	60 TO 64
20	4.2	65 TO 69
13	2.7	70 TO 74
7	1.5	75 TO 79
10	2.1	80 TO 84
43	9.0	85 TO 89
41	8.5	90 TO 94
48	10.0	95 TO 99
78	16.3	100 TO 104
21	4.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




5
5
OSHA
OSHA PENDING

(6)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214    60    64     4     1
     48     115200  480
  60  60  60  60  60  69  66  66  60  60  62  63  68  60  60  60
  60  65  65  60  67  61  60  60  60  65  64  60  60  60  63  61
  61  60  66  61  65  60  60  64  60  70  77  75  78  96  91  90
  82  89  91  82  82  90  81  93  92  65  67  79  67  87  98  64
  60  60  60  83  82  81  60  60  60  94  91  92 103 104 103 105
 104 104  92  87  86  85  89  89  94  91  91  91  92  91  92  89
  89  98  96 101  96  97  84  86 100 105 104 103 104 104  97  94
  94  92  93  97  93  95  96  95  92  94  87  95  89  97  93 101
 103 103 103 102 102 102 103  97 101 101 102  99 101 101 101 102
 102  98 100 100 100  99  98 101  99 101  94  95 100 100 101 100
 100 100 100 101  99 100  98 100 100  99  99  92  88  98  98 100
  98 100  99  98  99  98  98  99  95  99  99  99 100 100 100  99
  99  95  64  65  64  60  85  82  96  99  99  98 102 104  97  89
  64  63  67  69  88  85  99 102 105  99  94 104 103  98  97  97
 100  99  90  89  90 100  89  88  88  95  98  97  99  96 103 103
 102  94  97  82  81  93 102  92  98 102 101  97  93  95  99  99
  98  98 106  99 101  96  99 100  99  98  96  82  81  68  62  60
  60  60  60  60  60  60  64  72  60  60  64  64  61  60  65  90
  99  98  97  98  87  90  86  85  85  99  97  97  97  98 100 102
 102 100 100  98 100 102  98  98  96 100  99  99 100 102 102  99
 102 101  99  99  98  92  60  81 100 102 105 102 101 101  96  87
  97  96 101 101 102 102 105 104 103 100  98  89  95  96 100  99
 100  82  85  95 102 101 100 102  99  98 102 100  98  88  89  97
 100 101 102 102 101 101 101  98  95 102 100 100 100  98 101 102
 102  86 101 102  98 101 101  99 102  98  95  91  92  95 100 103
 102  99 100 103 101 102 100 101 101  97 101  98 100 101 101 101
 102 100 102 102 102 101 100 101  99 100 101 101 102 100  96  98
  99 100 100 102 102 102 100 101 101  98 102 100 100 100  98  98
 102  97  94 101 102  98 101 101  98 100  99  93 103 103 101 101
  99 102  97  60  60  60  60  60  61  98 100  99  77  78  92  88
%EOF


ENTER LOG DATE (DD/MM/YR) : 20/08/79
ENTER SITE CODE (5 CHARS) : 00310
ENTER USER CODE (4 CHARS) : 1862
 ENTER JOB CODE (3 CHARS) : 283


   DATA LOGGED :20  AUG 1979          DATA ANALYZED : 25 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : 00310
SERIAL NUMBER : 1214                      JOB CODE : 283
    BASELINE : 60 DB                     USER CODE : 1862
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:12

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CRITERION) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

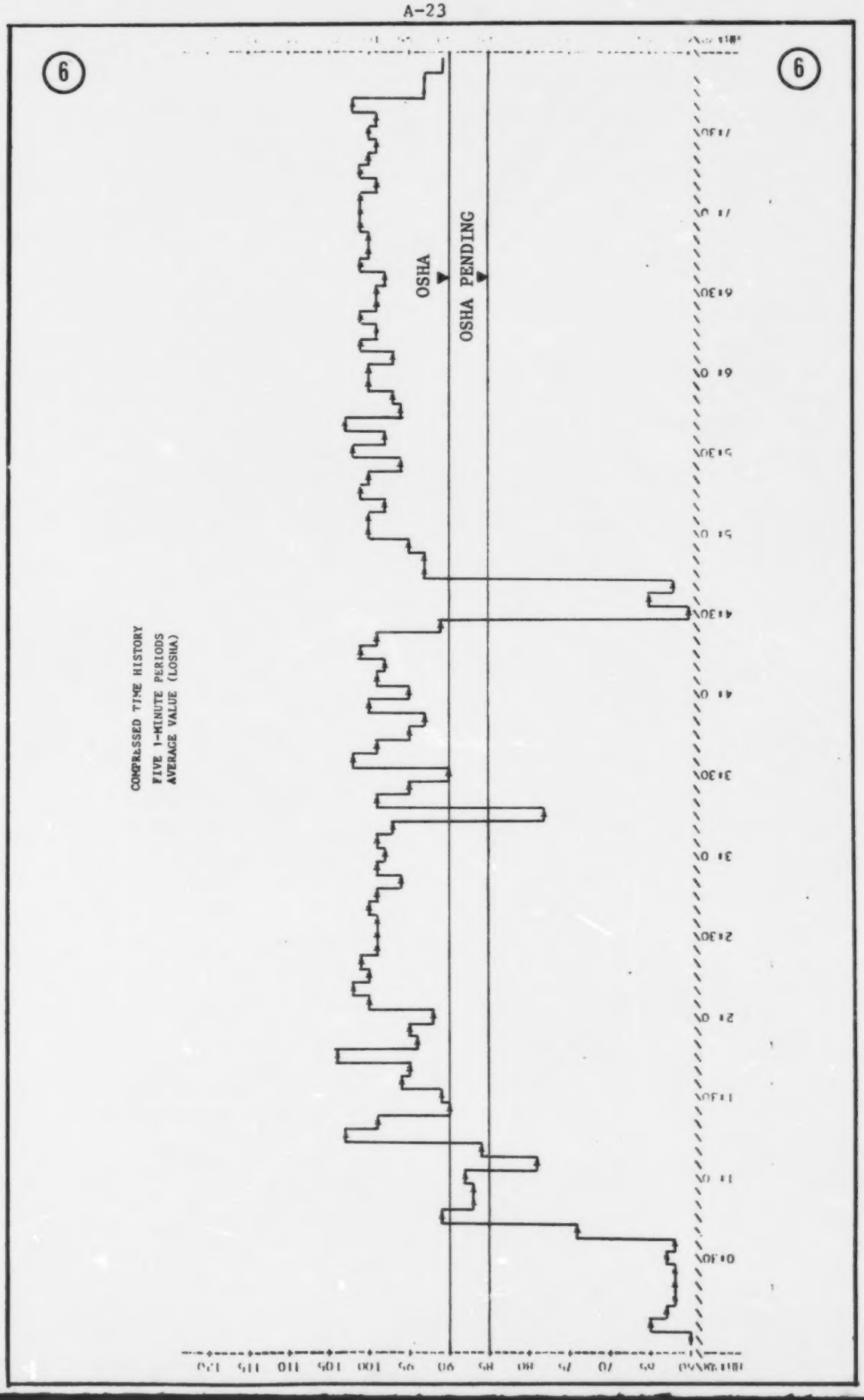
TIME          LOCAL                      DOSE
MODE    CURRENT  CUMULATIVE        CURRENT  CUMULATIVE
   1       79.1       79.1          2.776       2.78
   2       96.1       91.8         29.130      31.91
   3       99.5       95.3         46.389      78.29
   4       97.2       93.8         33.845     112.14
   5       94.5       95.6         23.451     135.59
   6       99.5       96.4         46.701     182.29
   7       99.9       97.0         49.433     231.72
   8       98.9       97.3         42.950     274.67
MIN. COMP. =  60 DB                MAX. COMP. = 106 DB
ARITHMETIC MEAN =  90 DB
STD. DEVIATION =  14 DB
VARIANCE =196 DB
```

(6)

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
65	13.5	60 TO 64
18	3.8	65 TO 69
2	.4	70 TO 74
6	1.3	75 TO 79
15	3.1	80 TO 84
32	6.7	85 TO 89
43	9.0	90 TO 94
126	26.3	95 TO 99
167	34.8	100 TO 104
6	1.3	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


6
6
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(7)

```
PLACE TAPE IN READER BUFFER AND PRESS RUN
 1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20
 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
 60 58 60 61 64 60 60 60 61 60 61 60 58 60 59 71
 59 62 71 70 64 62 70 69 64 62 60 64 58 61 60
 61 60 60 61 63 60 61 62 71 62 73 64 61 74 74 64
 90 92 106 98 101 96 102 102 95 95 101 96 97 93 91 96
 97 97 98 97 93 96 101 105 105 104 102 104 104 101 102 95
 95 93 95 92 94 92 94 85 92 92 89 92 89 87 87 90
 91 90 93 78 90 71 80 89 71 90 91 90 91 80 93 90
 90 86 76 88 85 88 80 88 92 88 94 82 84 89 84 90
 84 89 89 89 84 89 89 89 89 89 89 89 89 89 94 89
 84 82 86 83 81 86 84 91 84 84 82 85 84 88 88 85
 84 83 86 88 92 95 90 89 92 90 89 89 89 89 89 89
 89 89 89 89 89 89 86 91 90 90 89 91 89 97 102 95
 93 91 91 92 95 92 101 94 92 92 92 89 89 91 103 99
 89 89 89 89 89 89 89 89 89 92 89 89 89 89 89 89
 94 94 90 89 91 90 89 92 94 90 89 90 91 90 90 90
 89 89 89 89 89 89 89 89 89 89 89 89 89 89 89 89
 90 91 94 96 92 96 90 88 89 89 89 89 89 89 89 89
 89 89 89 89 89 89 89 89 89 89 89 89 89 89 89 89
 89 89 89 89 89 89 89 89 89 90 90 89 89 89 89 89
 89 91 91 93 89 89 89 89 91 90 90 90 90 89 90 91
 90 89 89 89 90 90 89 89 89 90 90 90 90 89 90 90
 90 91 90 95 96 97 98 98 101 98 94 90 90 90 90 90
 90 90 89 89 92 94 90 89 89 89 94 92 90 90 90 90
 90 92 93 90 90 95 91 90 90 90 90 96 92 90 91 91
 90 91 92 90 90 95 96 92 90 90 90 94 100 91 90 90
 89 90 90 90 95 89 89 89 95 90 90 89 89 89 89 89
 100 90 89 89 89 101 105 103 97 91 93 96 96 89 92 91
 91 92 92 96 99 92 91 101 98 100 101 84 101 101 101 101
 101 100 101 100 102 103 103 103 102 101 101 101 100 98 103 94
 97 91 91 92 93 92 94 95 103 103 102 97 101 102 103 104
$EOF
```

(7)

```
ENTER LOG DATE (MO/DY/YR) : 12/01/79
ENTER SITE CODE (5 CHARS) : 00210

ENTER USER CODE (4 CHARS) : 2566
 ENTER JOB CODE (3 CHARS) : 203
```

```
      DATA LOGGED :12 JULY 1979                DATA ANALYZED : 12 SEPT 1979
           LOGGER : [illegible]                     SITE CODE : 00210
    SERIAL NUMBER : 1216                            JOB CODE : 203
         GAS LINE : 60.01                           USER CODE : 2566
  SYSTEM IO GAINS : 64.01                          TRANSLOG  : 60.01
  SAMPLING RATE   : 4/SEC                  TOTAL SAMPLES =  115200
  TEST DURATION   =   8: 0: 0              STARTAT TIME  =   0: 0:33
```

TIME HISTORY ANALYSIS

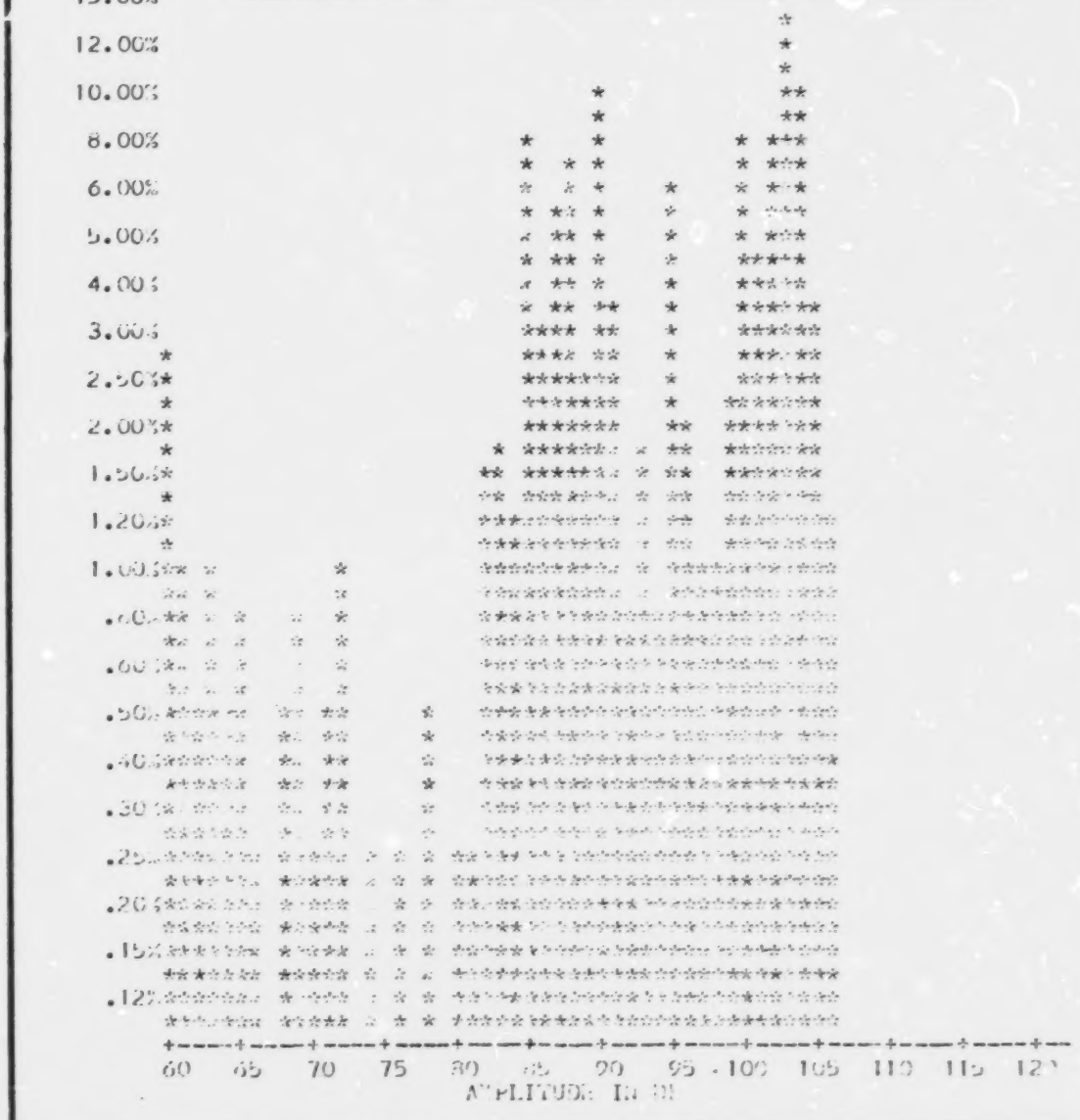
```
[illegible] EXPONENTIAL LAG (E.L.) CALCULATIONS
AND CALLS OF THE FOLLOWING
TIME LOG  = 20.0  / 1.000
CASCADE (CALLED) RATE = 4.00
THRESHOLD (CUTOFF) LEVEL = 60.0
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 HOURS
```

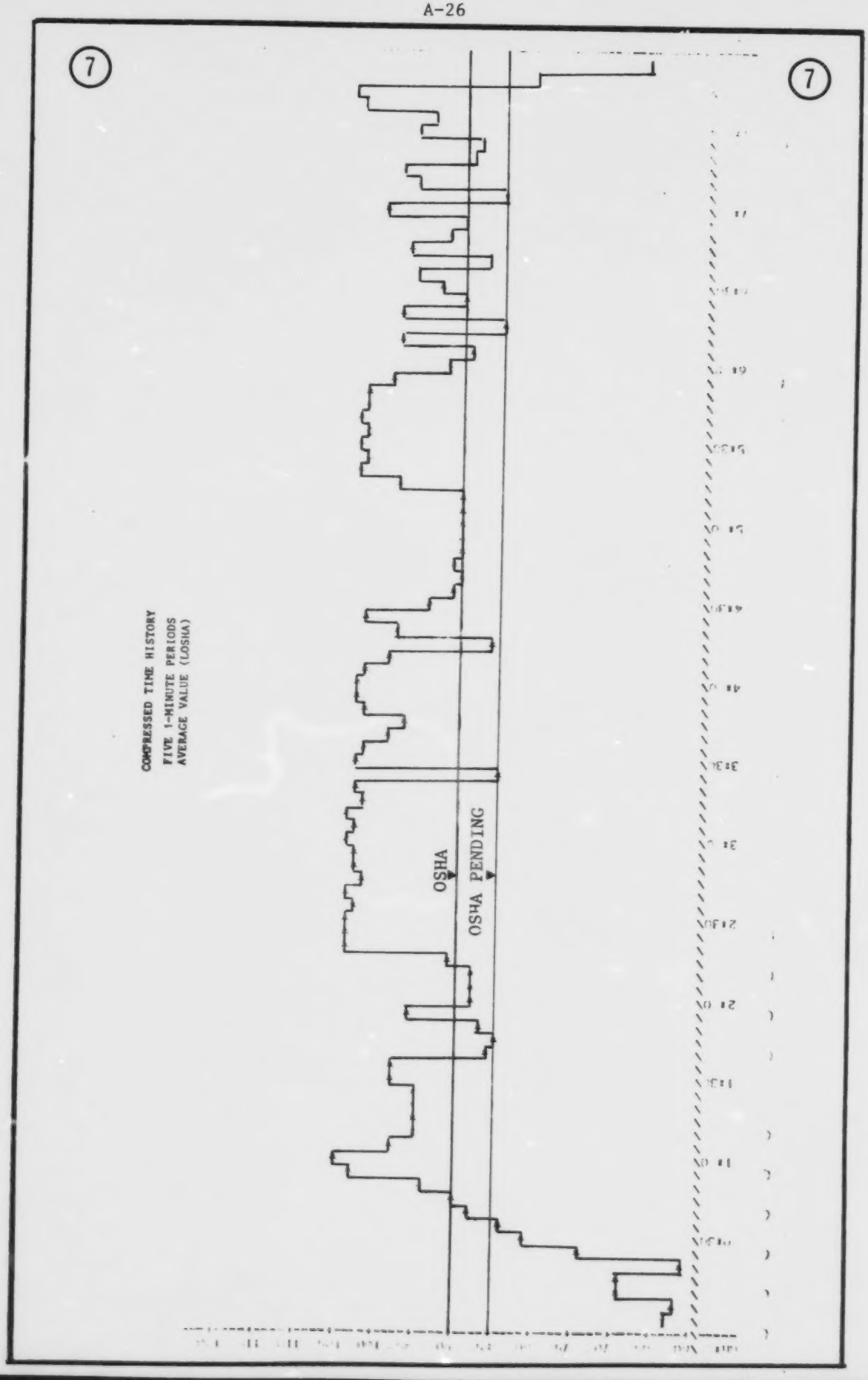
MODE	LOAD CURRENT	LOAD CUMULATIVE	SPEED CURRENT	SPEED CUMULATIVE
1	83.9	83.4	10.031	10.03
2	99.4	91.7	20.371	15.10
3	89.0	91.6	10.412	40.96
4	96.0	91.8	17.451	66.77
5	89.6	91.4	11.439	76.12
6	91.5	91.4	15.316	91.43
7	91.	91.5	10.150	101.57
8	92.2	93.0	14.681	116.26

TOTAL COUNTS = 60 [illegible] DATA COUNTS = 106 [illegible]
METHANE DATA TAKEN = 76 [illegible]
SPIKE INVALIDATED = 2 [illegible]
ANALYSIS = 1 [illegible]

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
25	5.2	60 To 64
10	2.1	65 To 69
6	1.3	70 To 74
4	.8	75 To 79
1	.2	80 To 84
191	39.8	85 To 89
141	29.4	90 To 94
51	10.6	95 To 99
48	10.0	100 To 104
3	.6	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




7
7
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(8)

```
PLACE TAPE IN READER THEN TYPE A <SPACE> AND A <RETURN>
  1  26  80  1216   60   64    4    1
     76      115200  480
  63  60  60  63  68  61  60  60  65  63  71  61  62  71  72  60
  76  72  65  60  60  61  64  60  60  60  69  78  80  70  69  86
  64  68  60  65  78  87  87  88  88  88  87  88  88  83  81  82
  91  92  86  85  85  95 102 103 100 103 105 105 106 106 105 106
 104 105  91  91  96  94  94  95  95  95  95  95  95  95  95  95
  95  95  95  95  95  95  95  95  97  93  93  93  93 101 105 101
 101  95  91  95  85  85  86  87  85  85  85  85  85  85  85  85
  86  89  88  88  89  98 101  96  88  88  88  88  88  88  88  88
  88  88  88  88  88  88  88  88  88  87  88  98 102 105 105 104
 104 104 102 104 105 103 101 104 105 104 104 104 102 103 104 104
 101 104 105 104 104 104 100 103 103  95  96 103 105 103 103 104
 103 103 102 102 103 105 104 104 104 103 102 103 104 104 104 102
 104 105 104 104 105 103 101  97 103 103 104 103 102  91  81  82
  82  82 104 104 103 103 103 101 103 103 103 104 103 102 101  83
  83  83  84  86 101 104 103 103 101 102 101 103 103 103 103 102
 103 104 103 103 103 101 101 103 102 103 103 102  90  82 102  93
  82  83  82  83  83  83  89 104 104 103 103 103 100 102 102  90
  90  90  90  90  90  91  91  92  90  90  90  90  90  90  90  93
  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
  90  90  90  91  90  90  90  90  90  90  91 102 100  87  99  96
 102 104 103 103 103 102 103 103 101 100 102 104 104 103 103 102
 102 103 102 100 100 103 104 103 104 103 101 103 102 102 100 100
 101 104 103  99  99 100  99  99  95  88  85  85  85  85  85  84
  84  97 100 100  99  98  85  85  85  84  84  85  85  97 100 100
  99  96  86  87  87  87  87  87  87  95 100 100 100  96  87  87
  87  87  87  86  87  87  99 100 100  93 100  92  86  86  86  87
  86  87  87  96 100 100 101 100  96  85  86  85  85  85  85  85
  95 100 100 100 100 100  94  89  89  89  90  89  89  90  91  86
  85  85  85  85  85  99 103 100  91  91  91  91 102 103 103 105
 100 105 106 106 102 102  91  74  69  62  72  72  63  69  61  66
%EOF
```

(8)

ENTER LOG DATE (DD/MM/YR) : 13/07/79

ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 2568
ENTER JOB CODE (3 CHARS) : 283

DATA LOGGED :13 JULY 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1216
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

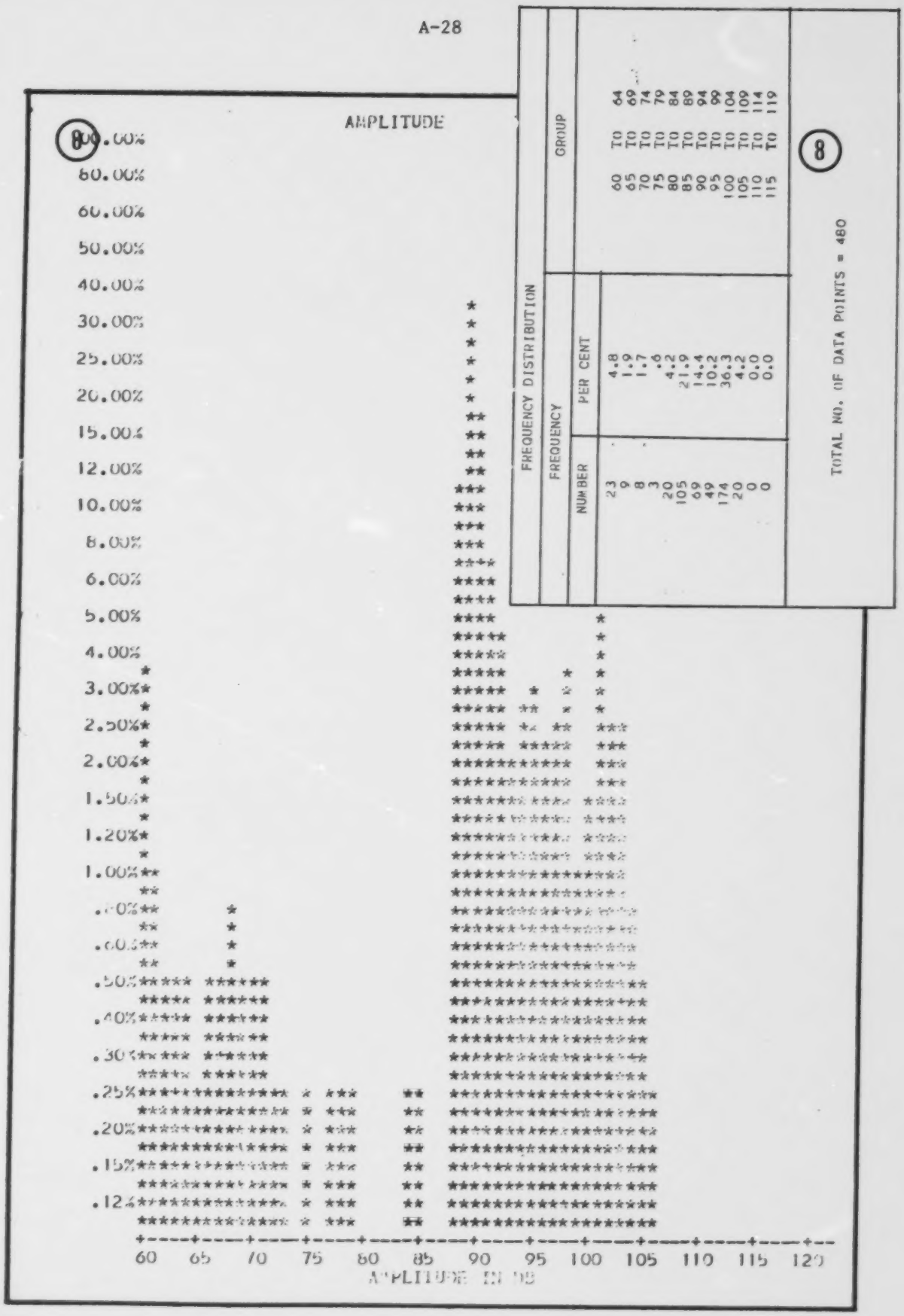
DATA ANALYZED : 12 SEPT 1979
SITE CODE : CC210
JOB CODE : 283
USER CODE : 2568
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STARTED AT = 8: 0:17

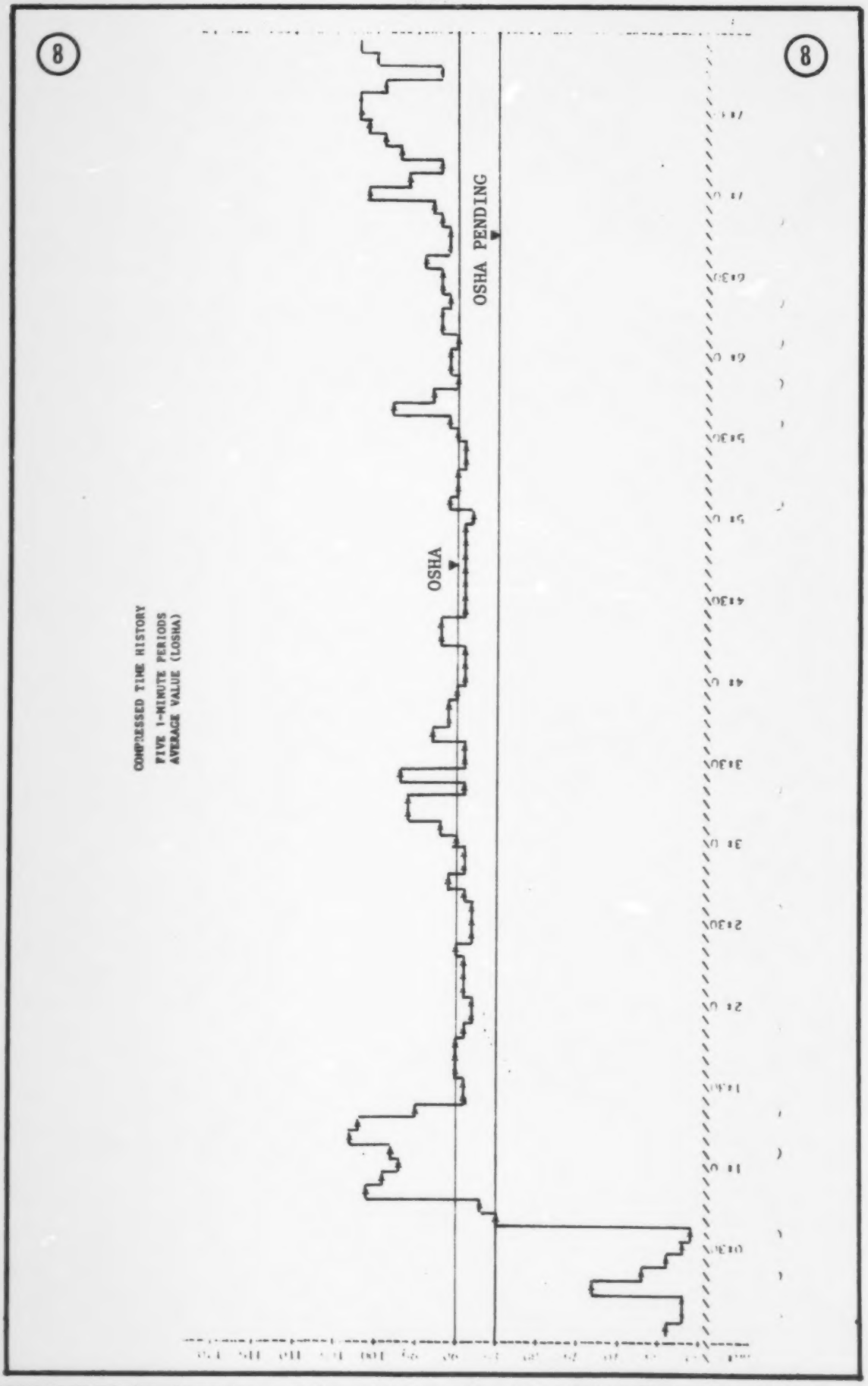
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ALL TABLES ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	89.3	89.3	11.416	11.42
2	90.5	93.8	30.660	42.08
3	100.5	98.9	55.582	97.62
4	101.8	98.5	63.978	161.60
5	96.9	96.2	32.735	194.34
6	100.2	96.6	51.157	245.50
7	93.0	92.0	20.452	265.95
8	96.3	97.8	29.450	295.40

IN CLASS = 60 DB. [illegible]
ABOVE THIS CLASS = 90 DB
DOSE IN THIS CLASS = 11
TOTAL DOSE = 101 %


AMPLITUDE
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
PER CENT
NUMBER
60 TO 64 23 4.8
65 TO 69 9 1.9
70 TO 74 8 1.7
75 TO 79 3 .6
80 TO 84 20 4.2
85 TO 89 105 21.9
90 TO 94 69 14.4
95 TO 99 49 10.2
100 TO 104 174 36.3
105 TO 109 20 4.2
110 TO 114 0 0.0
115 TO 119 0 0.0
8
8
TOTAL NO. OF DATA POINTS = 480


8
8
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(9)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1   26   80   1725     60     64      4      1
      177      115200   480
  60   60   60   67   60   60   60   63   62   71   62   63   67   76   60   70
  67   71   65   64   66   66   71   64   62   68   76   77   73   84   82   72
  71   63   60   60   77   74   90   94   91   91   91   92   93   94   93   93
 103  106  104  108  106  106  106  102  107  106  105  106  107  107  107  107
 106  106  106  105   99   99   99   99   98   98   98   98   98   98   93   98
  98   98   98   98   98   98   98  107  100   90   90   90   99   96   99   98
  98  105  105  105  106  104  103  106  105   98   98  105  103  103  104  102
 105  106  106  102  100  105  107  106  107  105  106  107  103  104  100  101
 103  109  107  108  108  106  108  105  109  110  103  103  101  107  111  107
 106  103  107  103  105  110  109  102  102  103   94  110  107  107  105  107
 108  108  107  107  100  108  110  105  103  103  106  109  108  103  102  101
 108  110  107  108  109  105  107  107  110  111  103  101  103  101  102   98
 101  102  110  109  106  108  108  103  107  102  110   95   92  101  100  107
 108  107  109  106  105  107  106  110  102  103  103  102  100  107  107  107
 107  104  108  108  110  108  104  104  102  104  105  106  106  106  105  106
 106  105  106  105  105  107  106  105  105  105  104  104  105  105  104  104
 105  106  106  105  104  105  106  106  105  105  105  105  105  104  106  107
 106  103   99   99  100  103  110  108  108  102  107  104  102  106   93   94
  94   94   93   94   94   94   94   94   94   94   94   94   94   94   94   94
  94   94   94   94   94   93   93   94   94   95   99  102  105  106  105  105
 105  101  101  106  106  106  105  106  106  105  107  104  106  101  105  106
 106  105  107  107  105  107  106  108  103  105  106  104  105  105  107  105
 105  107  109  101   99  105  102  105  106  106  106  105  107  105  107  107
 106  101  105  108  107  107  105  107  108  108  101  101  100   99  106  107
 106  107  105  108  108  107  101  100  107  106  107  107  105  104  103  104
 106  107  107  104  107  107  108  109  100  101  100  104  107  107  103  105
 108  109  106  101  100  108  104  107  108  105  107  109  106  100   99  100
 108  103  103   99   96   98   98   97   97   97   98  102  103   75   64   60
  60   63   64   60   64   81   74   77   65   76   72   92   97   90   77   98
  97   98   98   95   71   90   70   74   83   82   96   84   95   94   77   74
%EOF
```

(9)

```
ENTER LOG DATE (DD/MO/YR) : 13/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4110

 ENTER JOB CODE (3 CHARS) : 284
```

```
    DATA LOGGED :13 JULY 1979
         LOGGER : CR-3017/26
SERIAL NUMBER : 1225
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   81 :  0

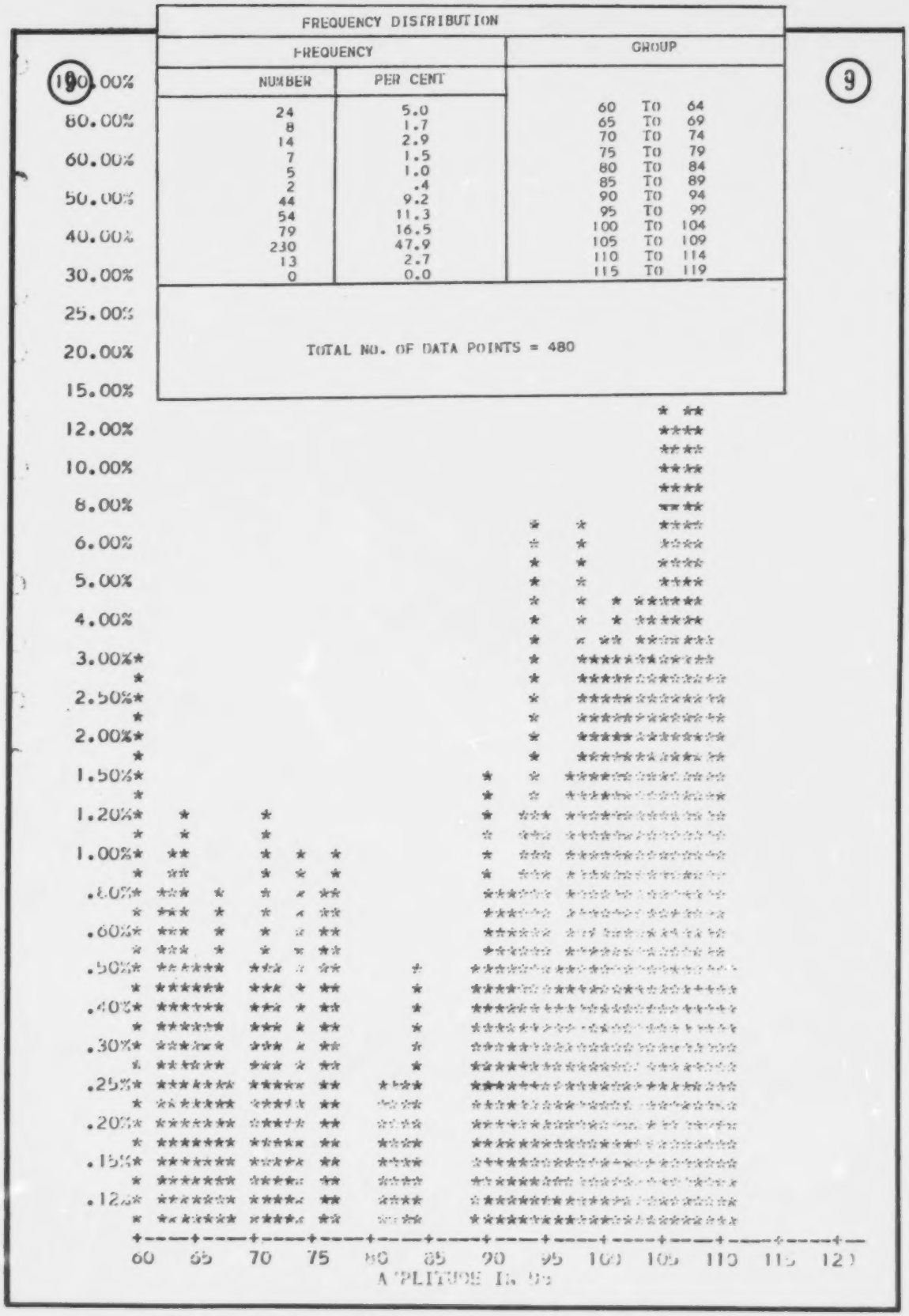
DATA ANALYZED : 12 SEPT 1979
     SITE CODE : CC210
      JOB CODE : 284
     USER CODE : 4110
    THRESHOL   :  80 DB
TOTAL SAMPLES  =  115201
STANDBY TIME   =    0 :  0
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME HOUR	LOGA CURRENT	LOGA CUMULATIVE	DOSE CURRENT	DOSE CUMULATIVE
1	95.2	95.2	25.541	25.54
2	102.6	99.8	71.948	97.49
3	106.6	103.0	121.370	220.86
4	106.1	103.9	117.109	337.97
5	104.0	103.9	97.439	435.41
6	103.8	103.9	94.107	514.42
7	104.7	104.3	117.[illegible]	631.93
8	96.1	103.8	51.[illegible]	683.42

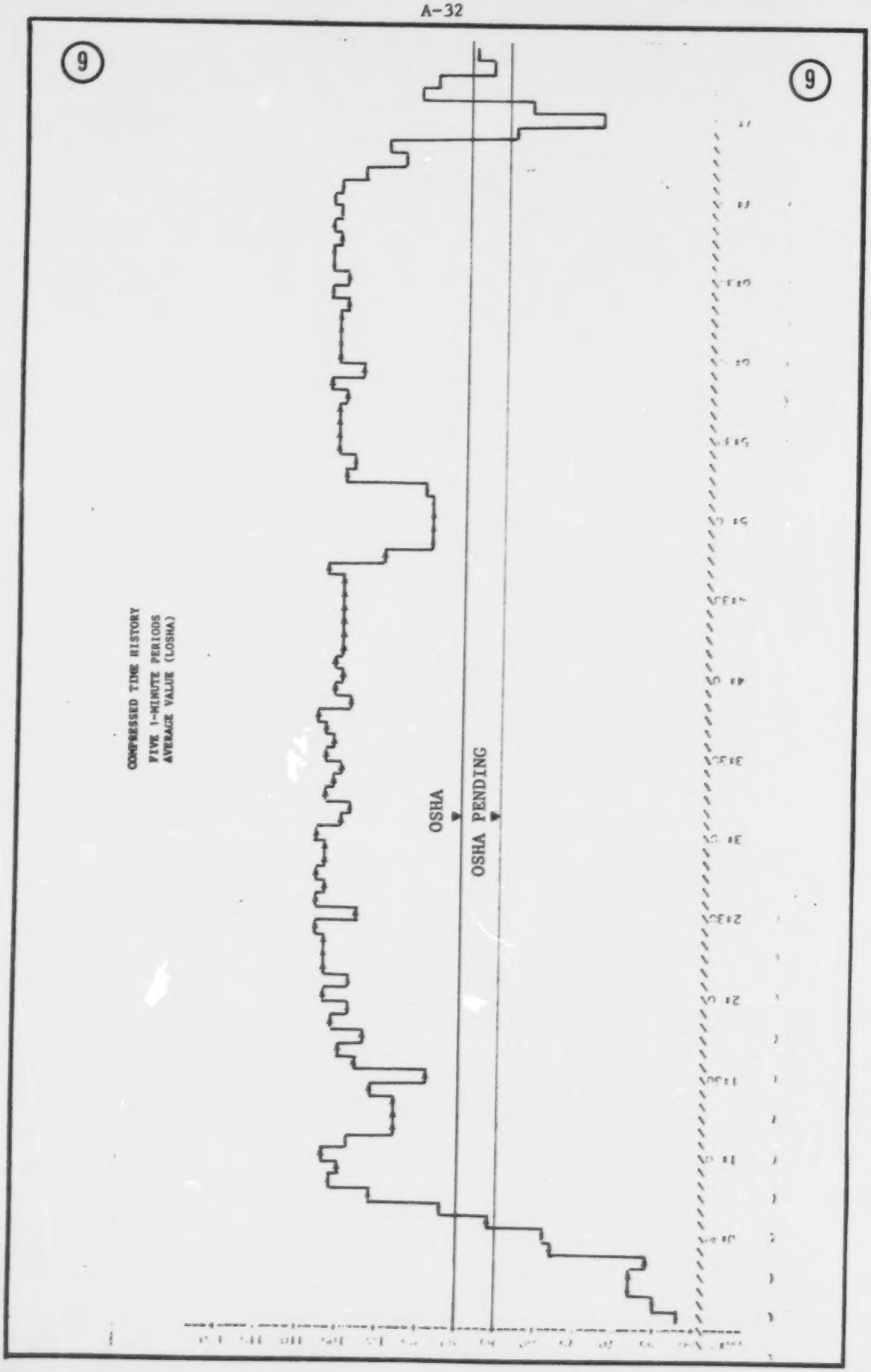
```
MIN. CODE = 60 DB                MAX. CODE = 111 DB
AUDIO TAPE DATA =  45 DB
STD. DEVIATION =  15 DB
VALID DATA =[illegible]
```



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
24	5.0	60 TO 64
8	1.7	65 TO 69
14	2.9	70 TO 74
7	1.5	75 TO 79
5	1.0	80 TO 84
2	.4	85 TO 89
44	9.2	90 TO 94
54	11.3	95 TO 99
79	16.5	100 TO 104
230	47.9	105 TO 109
13	2.7	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


9
9
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(10)

```
PLACE ANY IN HEADER DATA TYPE A (ALPHA) OR B (BINARY)
 1  20  60  1224   60   64    4    1
 12288    115200   200
 70  70  71  69  72  78  74  76  66  79  80  64  72  76  73  75
 75  74  69  76  73  75  0  74  75  73  92  95  92  76  72  73
 98  93  84  78  65  60  72  93  93  91  98 103 104  91  91  96
 96  96  99  96  94  96  96  97  96  97  97  97  95  91  96  97
 96  96  95  96  97  99 100 103 100 103 107 107 106 106 106 104
106 107 104 103 104 107 107 107 107 105 104 103 103  91  92  92
 96  96 103  93 102 104 103  96  94 102  95  90  96 103 103 103
103 104 105 101 103 106 101  97 102 102 101 103 103 105 105  98
 95  97 104 104 101 102 103 105 102  98 104 101 102 103 103 101
103 103 102 103 102 102 103 103 106  95  97 105 104 103 103 102
104 105 103 103 103  97  96 102 105 103 105 105 104 102 102 103
104 104 104 105 104 103 104 104 102 103 103 104 105 100  94  97
103 104 103 106 102 104 103 103 103 103  96 105 103 103 103  96
106 101  97 104 105 105 104 104 103 102 103 103 103 104 103 102
101 102 103 102 102 103 102 102 102 102 102 101 102  93 103 100
 96 100 103 104 103 103  90  90  90  90  90  91  90  90  90  90
 90  90  90  90  90  90  90  90  90  90  90  90  89  92  92  93
 97  90 101 103 100  98  96  88 103 104 103 103 103 102 103 105
104 104 105 105 103 102 104 103 104 104 104 104 105 101 103 105
102  99  89 101 102 102 105 104 103 103 102 103 104 104 102 103
103 103 105 102  95  96  99  95 103 104 105 102 103 103 104 103
103 104 105  98  99 104 103 103 103 104 101 104 102 103 104 103
 95  94  95  95  95 103 104 105 104 104 103 104 104 103 104 102
 94  96 102 103 103 102 105 104 103 103 102 104 105 100  95  99
104 104 103 104 103 104 103 105 101  94  94  98 104 103 104 104
103 105 105 104 101  95  95 101 105 104 105 104 103 104 104 104
105 101  94  98 104 104 104 104 103 104 104 105 104  95  94 101
104 104 104 106  94  93 103 104 104 103 101  98  97  90  91  92
 91  97 103  78  72  63  61  60  63  64  70  74  76  70  72  76
 82  75  70  62  74  80  80  79  75  79  76  68  73  74  86  93
&EOF
```

(10)

```
ENTER LOG DATE (MM/DD/YR) = 11/07/79
ENTER SITE CODE (5 CHARS) = 30289
ENTER USER CODE (4 CHARS) = 7914

 ENTER JOB CODE (3 CHARS) = 283
```

```
    DATA LOGGED = 11 JULY 1979                DATA ANALYZED = 12 SEPT 1979
         LOGGER = DE-301/26                        SITE CODE = 30289
SERIAL NUMBER = 1224                               JOB CODE = 283
       LASELLA = 40 DB                            USER CODE = 7914
DYNAMIC RANGE = 64 DB                          THRESHOLD = 40 DB
SAMPLING RATE = 4/SEC                     TOTAL SAMPLES = 115200
TEST DURATION = 8 HR 0 MIN                STANDBY TIME = 1120.7
```

TIME HISTORY ANALYSIS

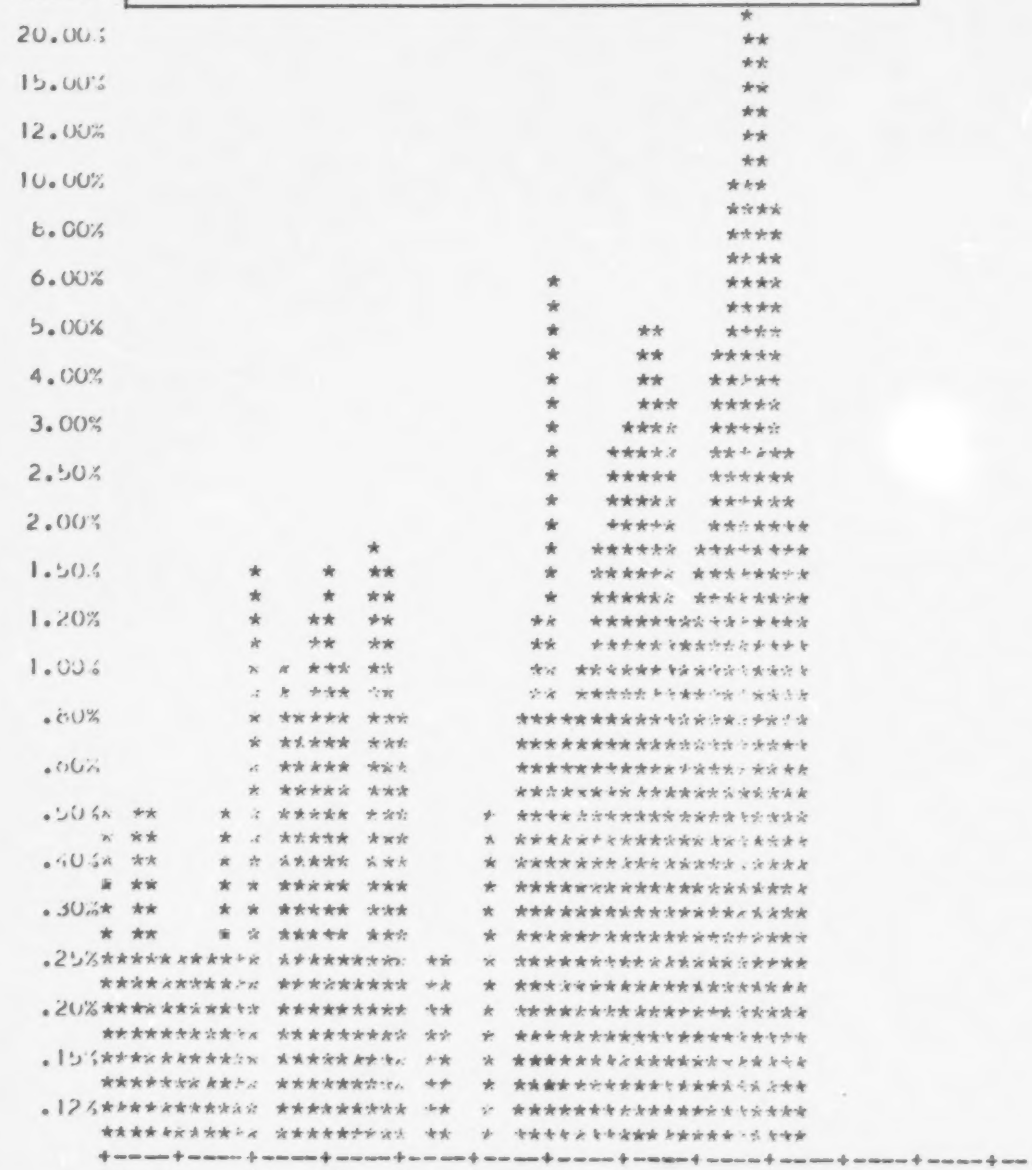
AOIS - AUDIBLE INDEX (A.I.) CALCULATIONS
AND - BASED ON THE FOLLOWING
100 DB = 40 DB / 4 AOIS
EXCHANGE (DOUBLE) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 40 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		AOIS	
AOIS	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	91.0	91.0	14.401	14.40
2	103.3	99.1	68.611	83.1
3	102.2	101.3	74.354	126.49
4	103.1	101.9	72.1	207.01
5	99.5	100.1	45.414	271.42
6	102.3	101.0	68.865	344.46
7	102.2	101.2	71.253	415.31
8	97.7	100.4	43.701	459.10

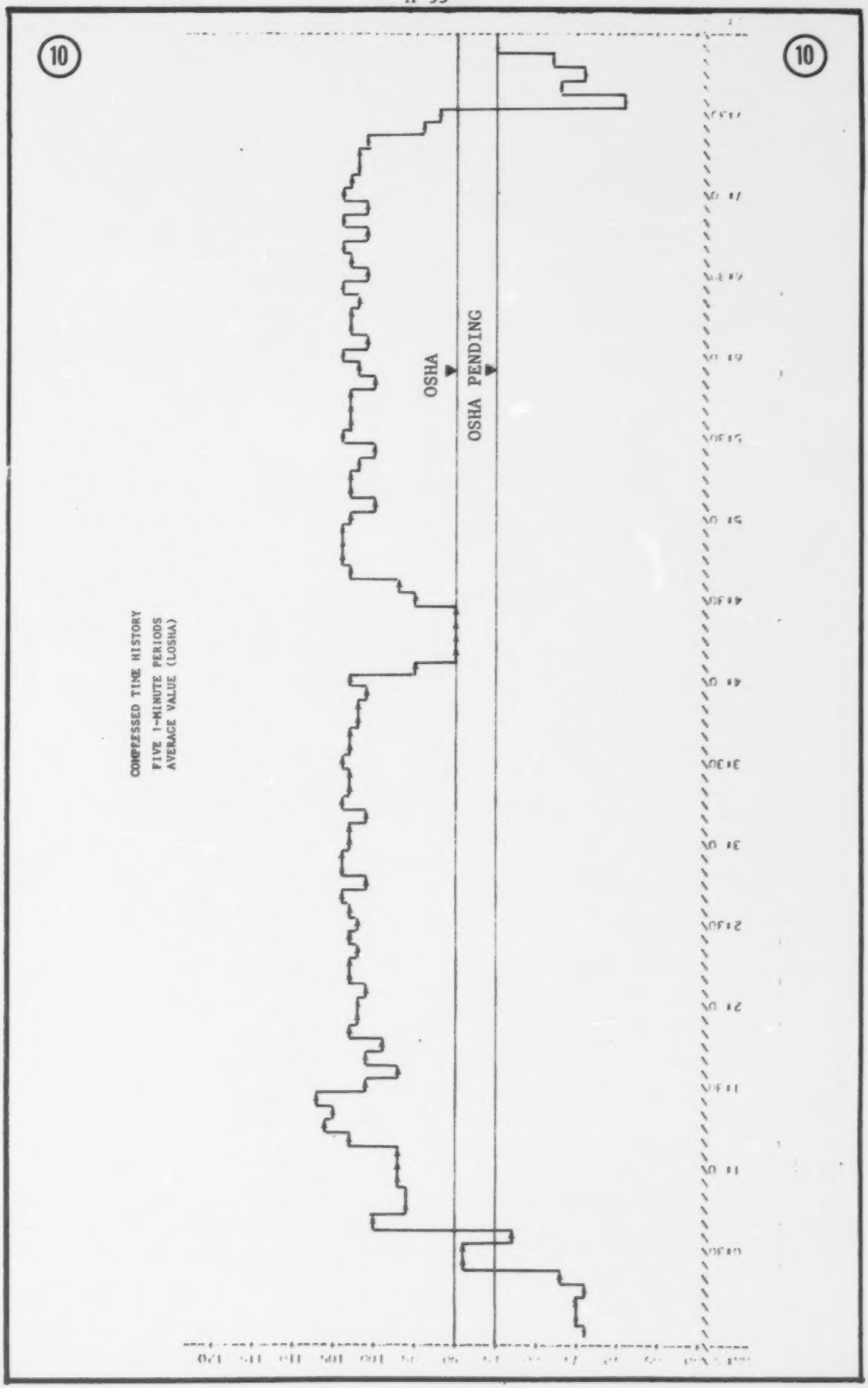
MIN. CUM. = 40 DB MAX. CUM. = 101.9 DB
AVERAGE SOUND = 41 DB
DYN. DIVERSITY = 10 DB
VARIANCE = 1.6 DB

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
8	1.7	60 TO 64
6	1.3	65 TO 69
18	3.8	70 TO 74
24	5.0	75 TO 79
5	1.0	80 TO 84
10	2.1	85 TO 89
49	10.2	90 TO 94
70	14.6	95 TO 99
236	49.2	100 TO 104
54	11.3	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

(10)



(10)


10
10
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(11)

PLOT TABLE OF MEANS FOR STATE A (CODE) AND A (CODE)

1	2	3	4	5	6	7	8	9							
1/0001		1152/30	2	3											
71	70	71	63	67	63	71	70	61	63	68	74	76	73	72	69
72	90	89	93	94	94	92	90	94	94	93	93	96	96	93	91
91	62	91	73	82	98	96	94	91	93	91	91	101	97	60	62
82	79	77	85	84	81	75	81	82	85	91	81	78	73	63	65
60	3	59	5	71	70	5	85	73	74	73	76	72	73	3	73
90	91	91	92	85	83	92	89	85	86	89	87	91	91	92	92
83	83	83	3	83	83	91	91	91	91	1	1	1	91	83	91
1	1	1	2	2	2	2	2	1	1	2	2	2	2	2	2
91	1	1	91	91	91	91	91	1	91	1	91	1	91	91	1
2	2	2	91	91	93	93	96	91	91	91	96	91	91	91	91
96	96	96	97	92	93	93	96	96	96	97	97	96	96	96	1
91	96	96	96	91	91	91	91	91	91	91	91	91	91	91	91
92	91	96	96	92	93	96	96	96	96	92	91	96	96	91	92
96	96	91	96	96	96	91	96	91	91	96	91	91	91	91	92
96	96	2	96	96	91	96	96	96	96	91	96	96	96	96	96
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	61	61	61	97	95	97	96	96	96
96	96	2	96	96	91	96	96	96	96	96	96	91	96	96	96
91	96	91	96	96	96	93	97	96	91	91	96	91	89	94	97
96	91	96	93	89	94	91	97	91	91	91	94	95	96	93	96
96	96	96	96	91	96	91	96	91	96	91	97	91	96	91	92
92	91	96	97	91	91	96	96	91	96	91	96	91	91	96	91
96	96	91	96	96	96	91	96	96	96	96	91	96	91	96	96
97	96	91	96	96	96	96	97	96	96	96	96	96	96	96	96
97	94	94	97	96	96	96	94	86	86	86	86	86	96	86	87
86	86	86	86	87	96	96	96	93	90	89	89	91	90	90	96
96	96	92	87	76	97	91	96	96	72	60	60	62	70	94	97
89	87	96	90	71	73	70	73	60	60	63	60	62	60	60	60
63	60	62	60	61	60	60	60	60	60	62	63	60	65	75	87
93	90	93	90	92	88	91	86	77	68	70	70	66	73	73	73

END

ENTER LOG DATE (DD/MM/YR) : 10/01/79
ENTER SITE CODE (5 CHARS) : JAPAN
ENTER USER CODE (4 CHARS) : 1579

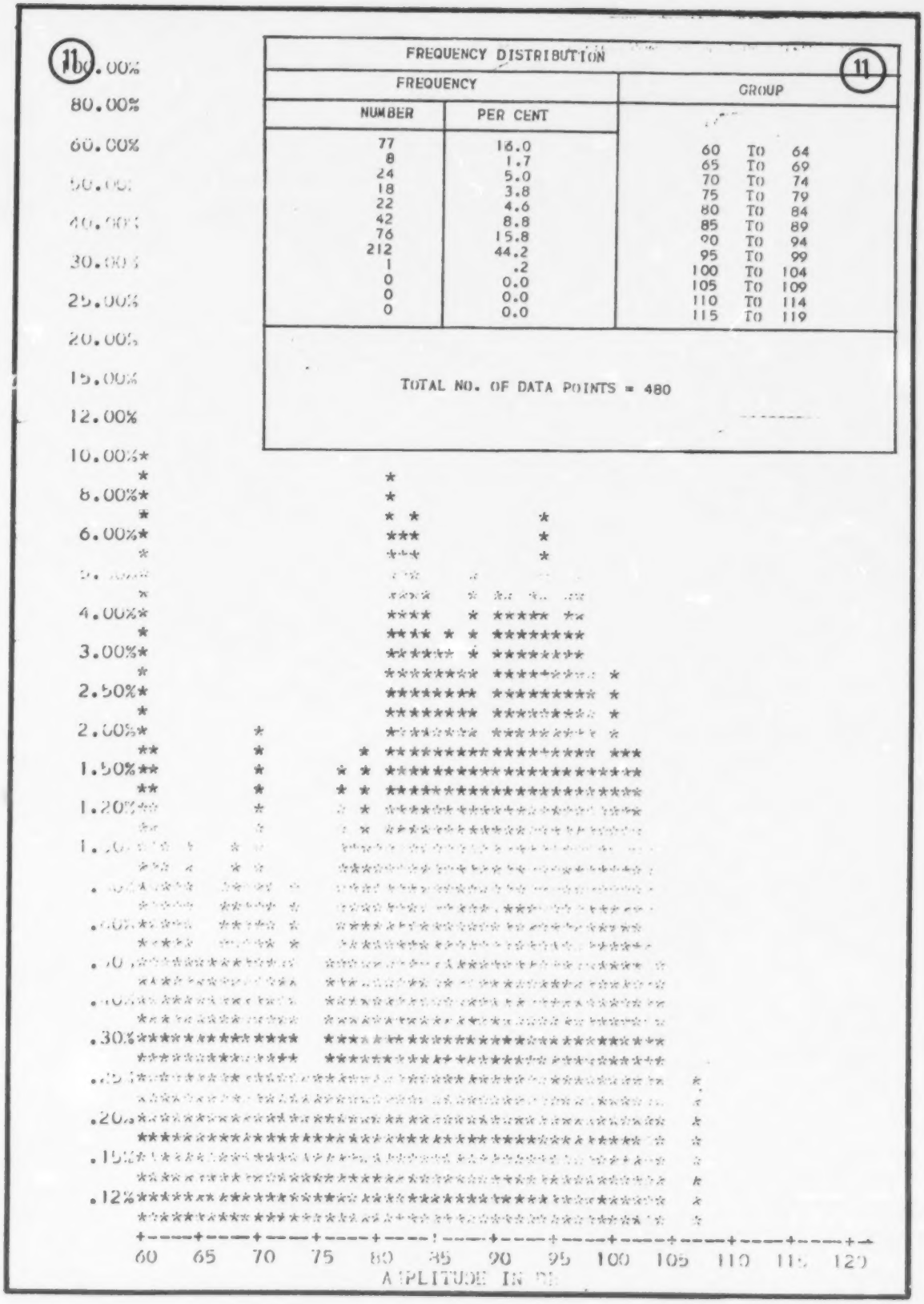
ENTER JOB CODE (3 CHARS) : 253

DATA LOGGED :10 JULY 1979
LOGIN : [illegible]
[illegible]

DATA ANALYZED : 11 SEPT 1979
SITE CODE : JAPAN
[illegible]

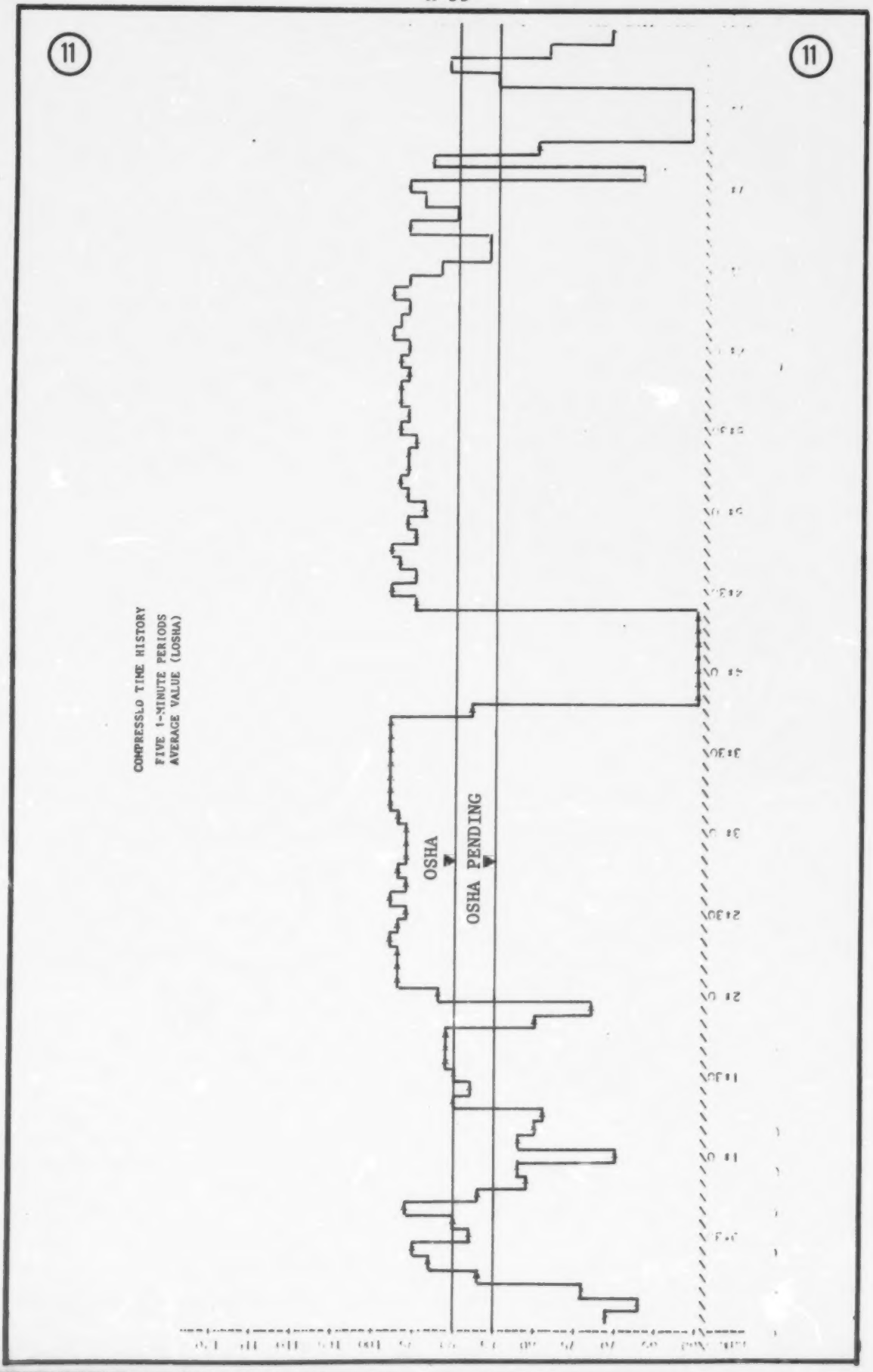
[illegible]

[illegible]



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
77	16.0	60 To 64
8	1.7	65 To 69
24	5.0	70 To 74
18	3.8	75 To 79
22	4.6	80 To 84
42	8.8	85 To 89
76	15.8	90 To 94
212	44.2	95 To 99
1	.2	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480


11
11
COMPRESSLD TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(12)

```
 1  26  80  1226   40   64    4    1
  20041     114757  475
60  62  62  63  62  60  60  62  60  60  61  61  61  60  60  60
63  75  69  66  70  60  67  69  67  71  74  67  66  65  65  70
 0  14  11  16  19  12  06  07  10  20  06  03  02  00  02  06
64  60  61  62  60  74  71  65  61  76  70  63  61  61  61  67
```

(12)

```
61  61  72  77  77  66  90  90  93 103 102 103  96  77 107  9
21  20  20  96  93  24  24  06  10 101  10 103 103 101 104 104
105 105 104 102 103 106 105 105 103 101 102 103  96  93 103 105
102 101 100 103 103 102 103  96  97 100 101  98  96 101 102 104
102  98 103 102 102 103 104 103  97 101 102 103 103 104  93  91
90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
90  90  90  90  90  90  90  90  90  91 101  90  90  90 103 103
104 102 102 102 102 103 102 102 102  96  99 100 104 101 103 103
101 102 101 103 100  98 104  99 104 102  99  99  96  97  94 102
 96 103 102 103  99  99  96  92  91  92 101 101  97  97 102 105
105 103  94  95  98  96  97  99  95 100 102 103 101 102  90  97
 98 100  92  96 100 101  98  95  98  93  97  97  98  99  99 101
 94  98 106 106 106 105 104 104 102  98 103 104 106 105 105 103
100 103 102 102 104 103 102 102 102 101 102 102  97 101 101 102
102 102 102 103 102 102 103 102 103 104 104 105  97  96  97  92
 90  88  96 104  90  80  84  73  80  63  65  62  63  63  73  89
 69  75  74  80  65  62  68  75  64  61  72  85  81  81  76  79
 83  82  83  80  82  85  85  83  90  85  87  80  80  85  83  91
 95  93  96  93  95  90  95  85  71  80  64  66  81  71  72  75
 80  79  76  79  73  74  62  78  63  80  68  66  80  69  80  69
```

```
ENTER DATA DATE (DD/MM/YR) : 10/07/79
ENTER ...ICE CODE (4 CHARS) : 2003
ENTER USER CODE (4 CHARS) : 2617
 ENTER JOB CODE (3 CHARS) : 2-3
```

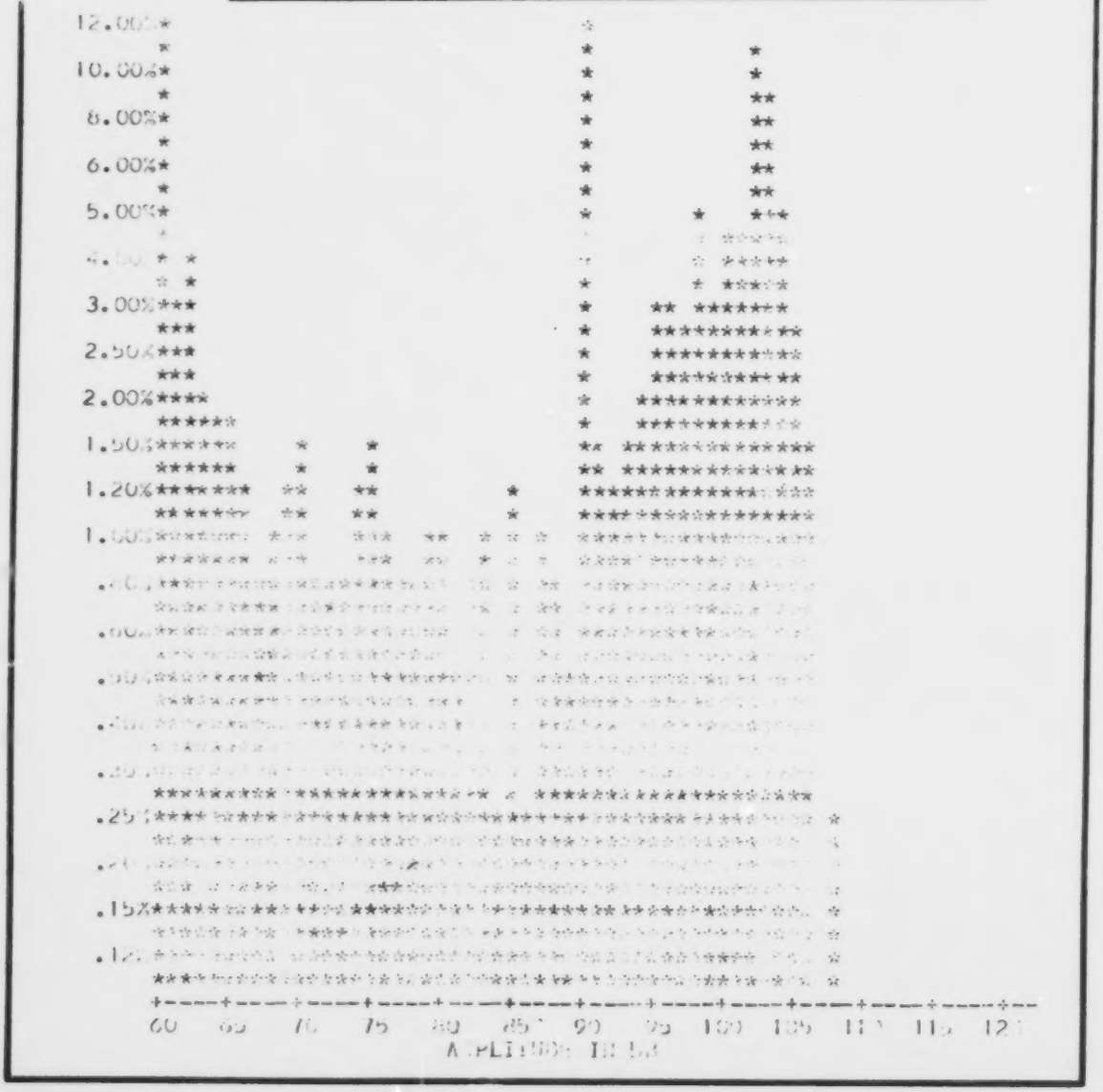
```
   DATA LOGGED :10 JULY 1979                DATA ANALYZED : 11 SEPT 1979
        LOGGER : 2-38/226                        SITE CODE : 3003
SERIAL # Read : 1374                             JOB CODE : 2-3
     CHANNELS : 08                               USER CODE : 2617
Max # Readings : 4096                            COMMENTS :
Max # Missing : 4096/0                   TOTAL # READINGS = 11264
Max Consec. = 78 : 8                     DATA COMPLETE = 11264 : 8
```

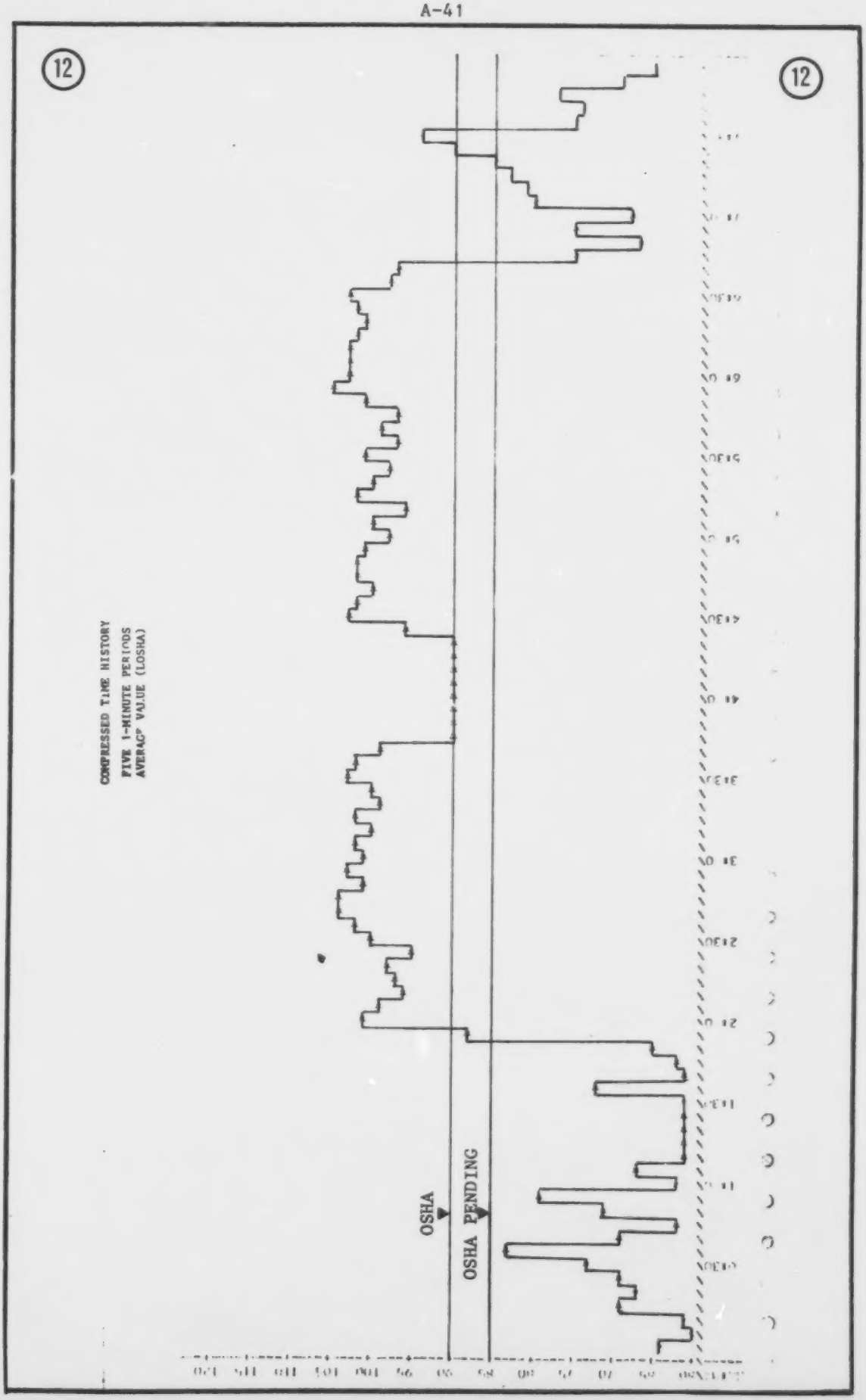
```
                    TIME SERIES ANALYSIS

 DIS  ...(...) I ... ( . ...) DATA(*) IS:0
 ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
 ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
 ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
 ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
   NUMBER OF COMPUTATIONS = 474
MEAN = 1 STDEV=5
```

```
 ...          ...
 ...  ...  ... ...  ...  ...  ...
   1   72.3   72.3   1.00   1.00
   2   73.2   73.3   1.00   ...0
   3   ...    ...    ...    ...
   4   ...    ...    ...    ...
   5   ...    ...    ...    ...
   6   99.9   ...    ...    ...
   7   ...    ...    ...    ...
   8   ...    ...    ...    ...
 ...  ... = ...  ...  ... = ...
 ...  ... = ...  ...  ... = ...
 ...  ... = ...  ...  ... = ...
 ...  ... = ...  ...  ... = ...
```

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
95	19.8	60 TO 64
24	5.0	65 TO 69
20	4.2	70 TO 74
20	4.2	75 TO 79
14	2.9	80 TO 84
15	3.1	85 TO 89
75	15.6	90 TO 94
66	13.8	95 TO 99
133	27.7	100 TO 104
18	3.8	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




12
12
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(13)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1   28   80  121.  60   64    4    1
     251      115200  480
 60  62  60  60  60  61  60  60  67  61  60  60  60  60  60  60
 60  62  61  63  62  66  61  60  60  75  69  71  71  66  71  63
 71  84  74  82  93  89  83  85  85  85  86  85  92  90  98  95
 94  88  85  80  92  94  79  84  85  95  80  92  93  96  95  95
 90  91  94  94  69  71  60  60  60  60  61  60  64  62  67  64
 63  62  60  61  64  60  60  60  61  60  60  60  60  60  60  60
 60  60  60  64  60  63  60  60  61  60  64  64  60  60  61  65
 64  69  95  99 103 100 104 103 102 103 100  61  60  64  60  60
 60  60  60  60  60  61  60  60  64  60  60  60  60  60  60  60
 60  60  60  60  60  67  66  62  64  69  62  60  62  60  62  67
 60  60  64  60  60  60  60  60  65  62  71  64  62  63  61  60
 61  60  65  63  61  60  71  68  60  81  68  81  80  60  63  73
 60  60  62  60  64  63  67  65  69  65  73  61  75  76  83  65
 62  63  64  64  64  78  62  80  76  62  63  63  61  62  53  63
 90  92  95  95  90  91  95  96  95  97  95  94  98 103 101  90
 91  97  86  79  69  81  77  71  93  92  84  89  80  71  84  90
 97  91  95 102 103 101  85 102 103 102 103 102  96 103 101 100
 83  78  92 102  96  72  60  60  60  60  60  60  60  60  63  60
 60  60  67  77  60  60  60  64  60  60  60  60  62  72  74  64
 69  75  73  72  77  72  72  78  73  80  77  76  89  97  92  84
 85  83  83  94  93  92  94 100 101 104 101 101 103 102 102 103
101  93 103 101 103 102 103 102 103 100 101 100 103 102 104 102
103  99  95 103 101 103 103 102 103 103 102  81  83  88  85  85
 84  85  84  87  85  95 102 100 102 102 102 102 102  96  90  89
 86  85  88  99 102  99 101 103 102 102 101 102 102 100  95  99
103 103 103 103 103 102 102 103 101  99  98  98 102 102 103  86
 78  77  68  81 102 102 100  96  70  60  66  60  71  84  60  66
 66  60  60  60  62  60  61  60  72  65  61  70  71  71  60  60
 60  60  60  60  61  67  68  65  68  82  91  72  61  63  60  62
 66  73  67  74  76  76  82  93  96  91  94  92  86  88  96  92
%EOF

ENTER LOG DATE (DD/MM/YR) : 17/08/79

ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 7827
 ENTER JOB CODE (3 CHARS) : CTI

   DATA LOGGED :17  AUG 1979
      LOGGER : DB-301/26
SERIAL NUMBER : 1212
     BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8  0  0

DATA ANALYZED : 21 SEPT 1979
    SITE CODE : ISHAF
     JOB CODE : CTI
    USER CODE : 7827
   THRESHOLD : 60 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =   0  0  2

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TIME DOSE = 50 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

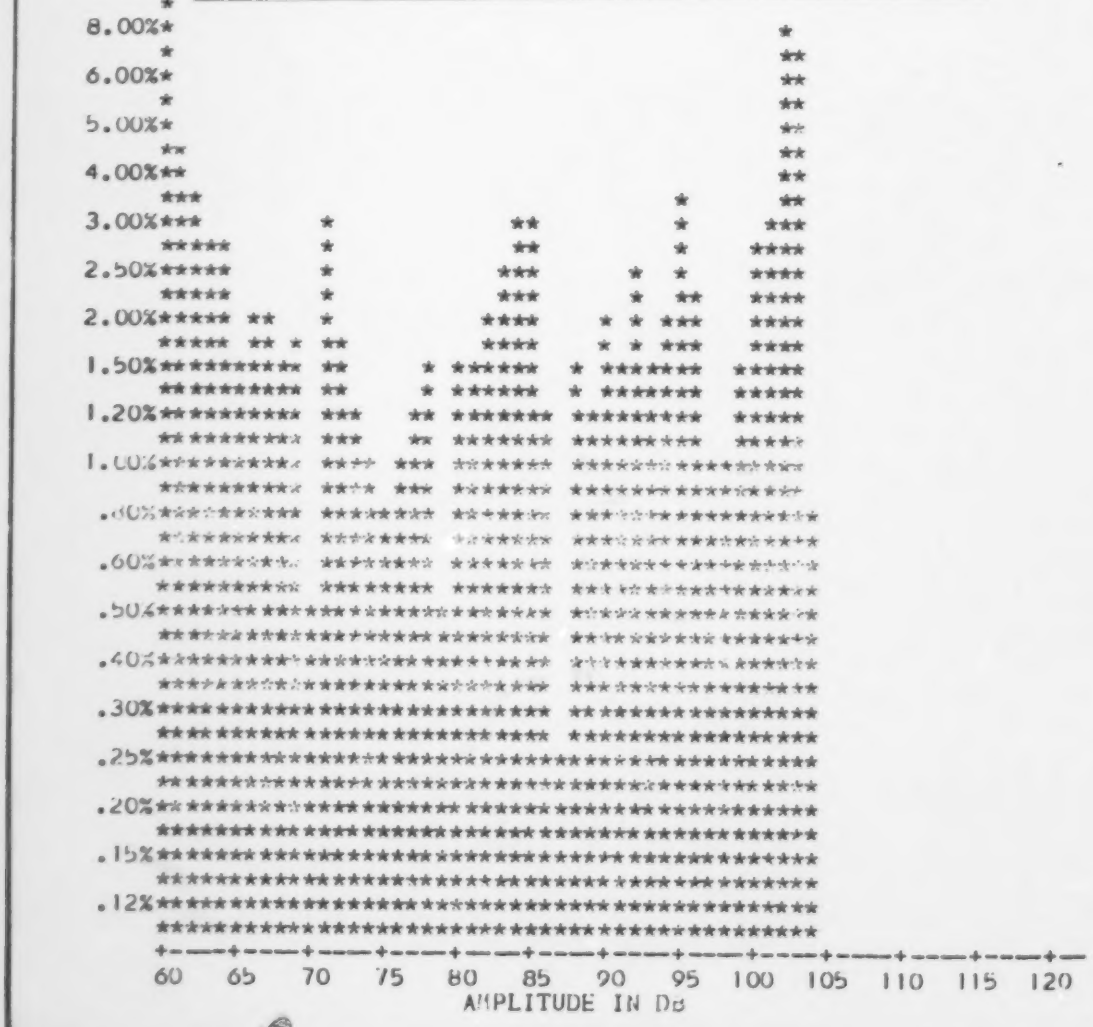
TIME          LOSHA                    %DOSE
HOUR    CURRENT   CUMULATIVE     CURRENT   CUMULATIVE
   1      84.4       84.4         5.750       5.75
   2      88.0       86.4         9.511      15.26
   3      89.7       87.0         3.446      18.71
   4      87.8       88.8         9.231      27.94
   5      92.7       87.8        18.124      46.06
   6      98.0       90.8        38.136      84.20
   7      96.8       92.7        42.304     126.50
   8      89.9       92.1         7.046     133.55
MIN. COMP. =  60 DB                MAX. COMP. = 104 DB
ARITHMETIC MEAN =  78 DB
STD. DEVIATION =  16 DB
VARIANCE =  256 DB
```

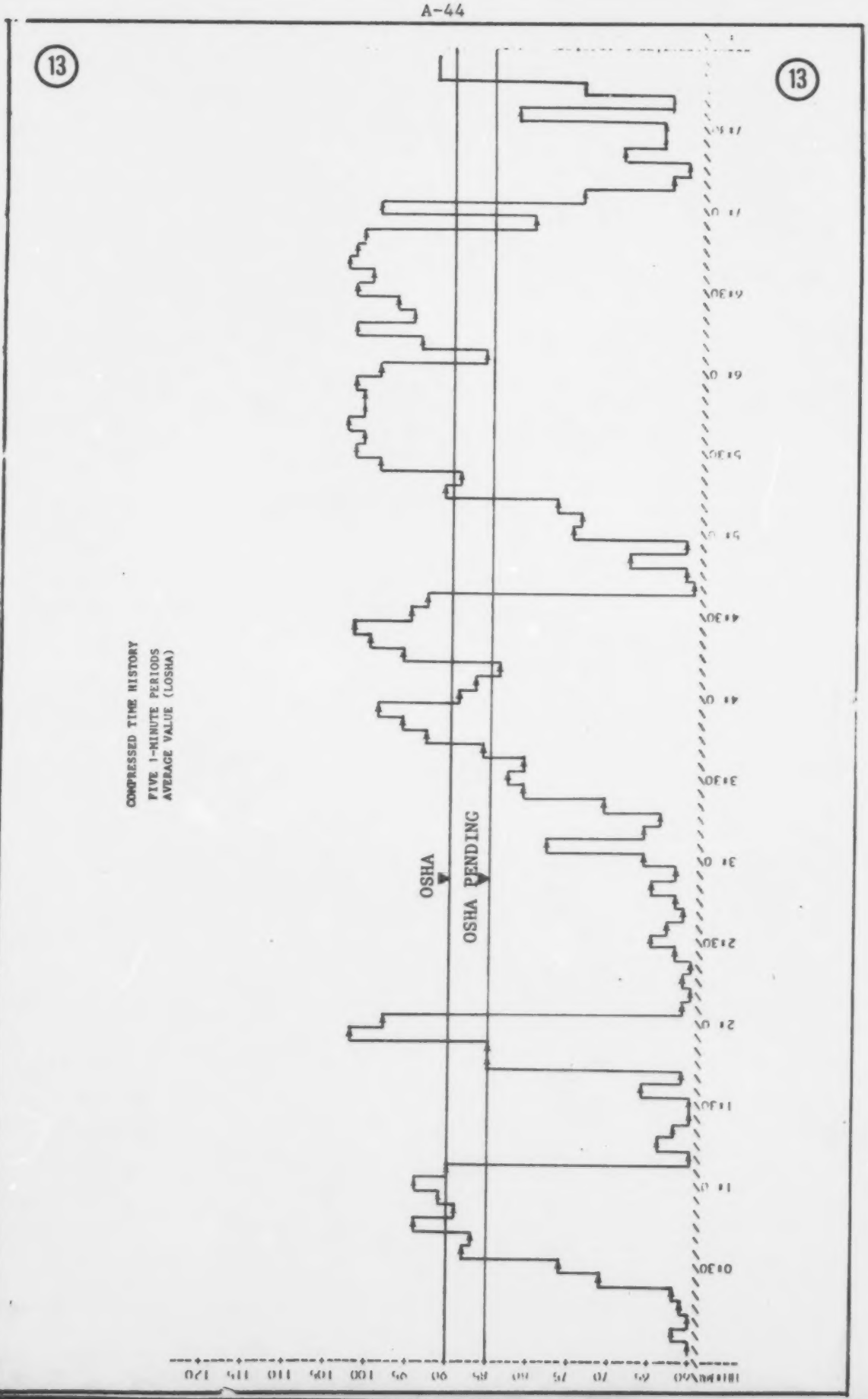
(13)

AMPLITUDE DISTRIBUTION

(13) (13)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
164	34.2	60 TO 64
35	7.3	65 TO 69
30	6.3	70 TO 74
20	4.2	75 TO 79
42	8.8	80 TO 84
29	6.0	85 TO 89
38	7.9	90 TO 94
37	7.7	95 TO 99
85	17.7	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




13
13
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
60
65
70
75
80
85
90
95
100
105
110
115
120

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

  1  20  80  120   60   64    4    1
     470    115200  460
 60  60  60  60  60  60  60  60  60  60  60  60  63  60  60
 60  60  61  60  60  60  60  60  60  60  60  60  60  60  61
 63  64  60  70  60  73  62  69  73  72  74  67  66  76  68  79
 75  67  62  68  70  60  62  82  60  69  60  60  60  76  69  60
 60  60  60  60  60  60  79  61  60  69  67  63  63  60  78  83
 63  77  65  60  64  60  60  60  70  60  66  76  77  71  67  83
 62  61  60  60  61 102  93  92  90  91  92  90  91  97  98  90
 84  [illegible]
 94  95  93  91  92  95  86  92  99 100 101  95 104  91  94  92
 99 100  97  96  97  93  87  82  82  78  82  96  96  94  95  [illegible]
 95  96  94  93  94  93  94  92  94  94  92  95  96  96  90  93
 94  92  [illegible]
 93  94  95  95  99 101  99 100  98  96  88  92  92  93  93  95
 94  95  96  96  97  92  92  94  94  94  94  93  91  90  91  91
 91  92  91  98  95  90  90  96  99  90  96 100  99  98  96  92
100 101 100 101 101 101 101 101 101 101 101 101 101 101 102  96  90
 90  90  90  90  80  79  76  77  83  94 102  96 100 102 100 101
100  98 102 100  95  99 100 100  97 100  95  89  89  89  90  91
 89  84  91  98 100 100 101 102 101  99 100 101 101 101  99 102
101 100 101 100 100 101  98 101 101 101 101 101 100 101 102 101
 93  63  60  60  60  60  60  60  60  60  64  71  60  60  61  60
 60  61  60  60  60  60  60  64  72  60  60  60  60  60  99  97
101 103 102 102  99  95 103 102 102 101 103 102  99  98  99  99
104  99 101 102 101 102 103 103 102 102 102 102 103 102 103  96
 99 102 102 102 102 102 103 100 103 103 104 102 102 101 101 102
102 102  98  97 101 102 102  97 102 103 103 101 102 102 102 101
102 103 103 104 105 104 105 104 100 100  99 101  96  78  83  82
 84  79  85  82  87  82  74  61  63  67  65  64  72  73  69  85
 67  60  60  63  69  60  60  60  60  63  60  60  65  60  61  60
 65  60  62  60  65  60  60  60  60  60  60  60  60  60  60  60
%EOF


ENTER LOG DATE (DD/MM/YR) = 24/08/79

ENTER SITE CODE (5 CHARS) = 00000
ENTER USER CODE (4 CHARS) = 4272

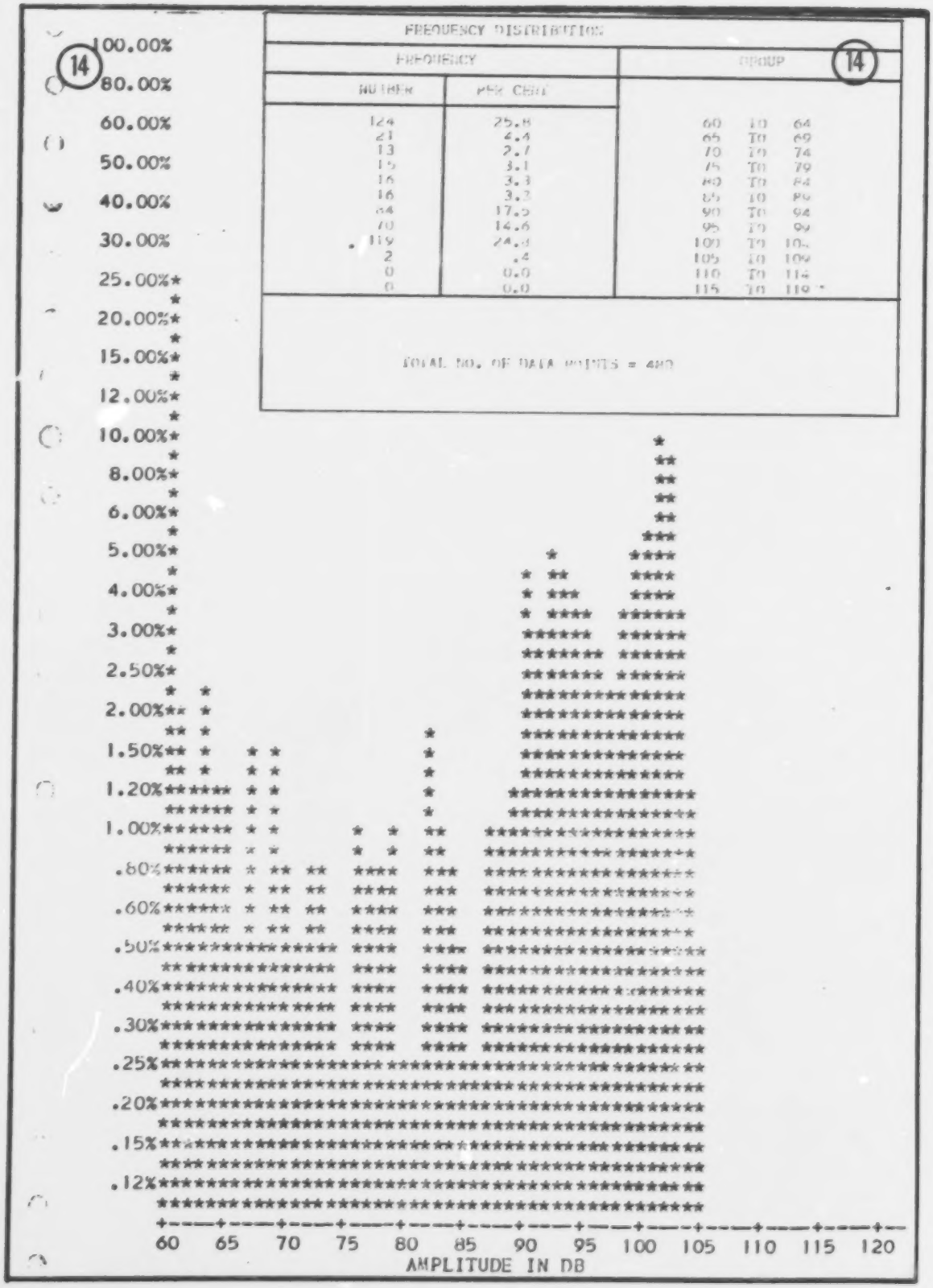
 ENTER JOB CODE (3 CHARS) = ST5


   DATA LOGGED =24  AUG 1979          DATA ANALYZED = 25 SEPT 1979
        LOGGER = DS-301/26                 SITE CODE = 00000
 SERIAL NUMBER = 1216                       JOB CODE = ST5
       CAL DATE = 80 01                    USER CODE = 4272
    VAX BUFFER = 96 01                     VERSION =
  SAMPLING RATE = 4/sec                    TOTAL SAMPLES =
  TOTAL DURATION =                         STANDBY AID =

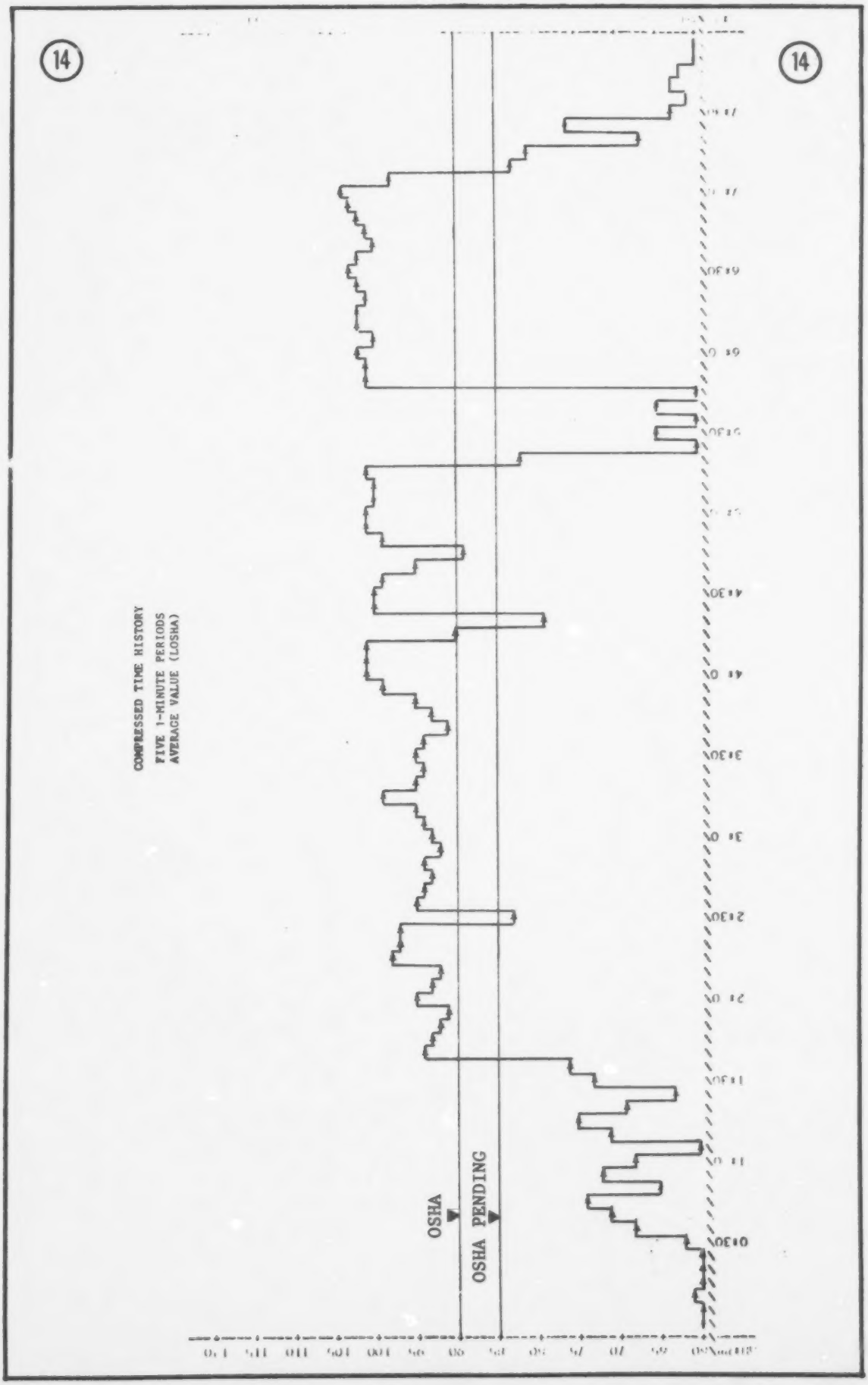

          TIME HISTORY ANALYSIS

 ANSI EXPOSURE LEVEL (L.E.L.) CALCULATIONS
 [illegible]
 L.E.L. DOSE = 90 DB / 8 HRS
 [illegible]
 [illegible]
   NUMBER OF COMPUTATIONS = 460
PERIOD =  1 MINUTES

 1                 LINEAR                    DOSE
 MIN.      1 MIN.    CUMULATIVE          CURRENT   CUMULATIVE
    1       99.1       99.1               .492        .49
    2       85.4       80.9              6.569       7.06
    3       94.4       [illegible]      22.473      22.93
    4       99.1       [illegible]      25.289      48.22
    5       94.1       92.9              8.264      56.49
    6       95.9       93.5             28.195     121.68
    7      101.7       [illegible]      62.943     184.64
    8       99.1       [illegible]      11.102     195.73
MIN. CORR. =  60 DB                   MAX. CORR. = 109 DB
ARITHMETIC MEAN =  94 DB
STD. DEVIATION =  17 DB
[illegible]
```



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP (14)
NUMBER	PER CENT	
124	25.8	60 TO 64
21	4.4	65 TO 69
13	2.7	70 TO 74
15	3.1	75 TO 79
16	3.3	80 TO 84
16	3.3	85 TO 89
84	17.5	90 TO 94
70	14.6	95 TO 99
119	24.8	100 TO 104
2	.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


14
14
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(15)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1219    60    64     4     1
      97      115200   480
  60  60  60  65  62  61  60  63  60  60  66  66  60  66  62  63
  63  66  63  64  61  61  60  60  60  60  64  65  60  62  82  98
  99  99  99  99 100  99  99  99 100 100 101 100 103 101 101 101
 101  97  98  98  96  99  98  95  95  99  91  95  96  95  97  99
  98  93  95  95  95  94  94  93  94  94  95  93  93  93  95  96
  97  98 100 100 100  98 102 102 101 100 103 102 103 103 103  99
 100 100 101  98  99 101 102 101 100 100 102 100 102 102 102 102
 102  99 100  99 101  99 100  99  99  92  98 102 100 100 101 101
 101  94  97 102 102 102 102 101  99  97  97 100 100  99  98  99
 100  95  97  97  91  94  99 101  98 101  90  93  93  70  67  73
  70  72  62  68  63  62  62  60  60  61  61  69  79  65  69  60
  73  66  66  64  60  60  60  60  60  83  88  78  62  73  81  64
  60  60  60  60  71  68  60  60  78  68  60  60  60  60  60  70
  69  60  60  60  79  60  60  60  60  74  65  60  60  75  60  60
  60  80  74  61  78  67  60  68  75  60  60  60  79  72  60  60
  60  60  77  75  60  72  61  60  60  60  60  60  68  60  60  64
  60  60  66  60  60  60  60  60  60  60  60  60  60  60  60  66
  60  60  60  60  60  60  60  68  60  60  60  60  60  60  60  60
  60  60  71  63  61  64  68  64  71  60  60  60  62  83  74  62
  88  97  78  72  67  77  75  74  77  81  74  69  71  81  82  87
  82  82  78  81  85  69  60  60  67  60  60  60  63  75  61  62
  65  68  82  85  81  72  70  73  81  79  73  87 103  99  94  92
  88  82  75  76  73  73  75  81  84  83  85  84  81  87  73  67
  82  85  87  85  85  85  85  85  85  81  80  76  80  83  83  84
  84  82  83  82  82  90  93  90  85  86  85  86  84  84  83  84
  84  84  84  84  84  84  85  84  85  84  84  84  85  84  84  82
  83  84  84  82  88  90  85  84  84  84  84  84  80  73  84  87
  69  60  60  60  74  84  86  83  81  81  81  81  81  91  85  90
  95  88  98  88  75  88  87  81  81  73  65  65  79  87  93  76
  78  64  67  69  67  62  65  79  63  73  70  66  72  70  64  61
%EOF
```

(15)

```
ENTER LOG DATE (DD/MM/YR) : 16/08/79
ENTER SITE CODE (5 CHARS) : 00000

ENTER USER CODE (4 CHARS) : 4561
 ENTER JOB CODE (3 CHARS) : RBR
```

```
   DATA LOGGED :16  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : 00000
 SERIAL NUMBER : 1219                      JOB CODE : SCH
      BASELINE : 60 DB                    USER CODE : 4561
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
 TEST DURATION =   8 HR 0 M           STANDBY TIME =   0 H 0 M
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 460
PERIOD = 1 MINUTES

TIME	LOGNA		LNEXP	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	93.7	93.7	20.859	20.86
2	99.3	97.0	45.192	66.05
3	95.3	96.5	25.973	92.02
4	71.0	94.5	.901	92.93
5	63.7	92.9	.325	93.25
6	83.9	92.0	5.387	98.64
7	84.3	91.3	5.673	104.31
8	83.4	90.6	4.989	109.30

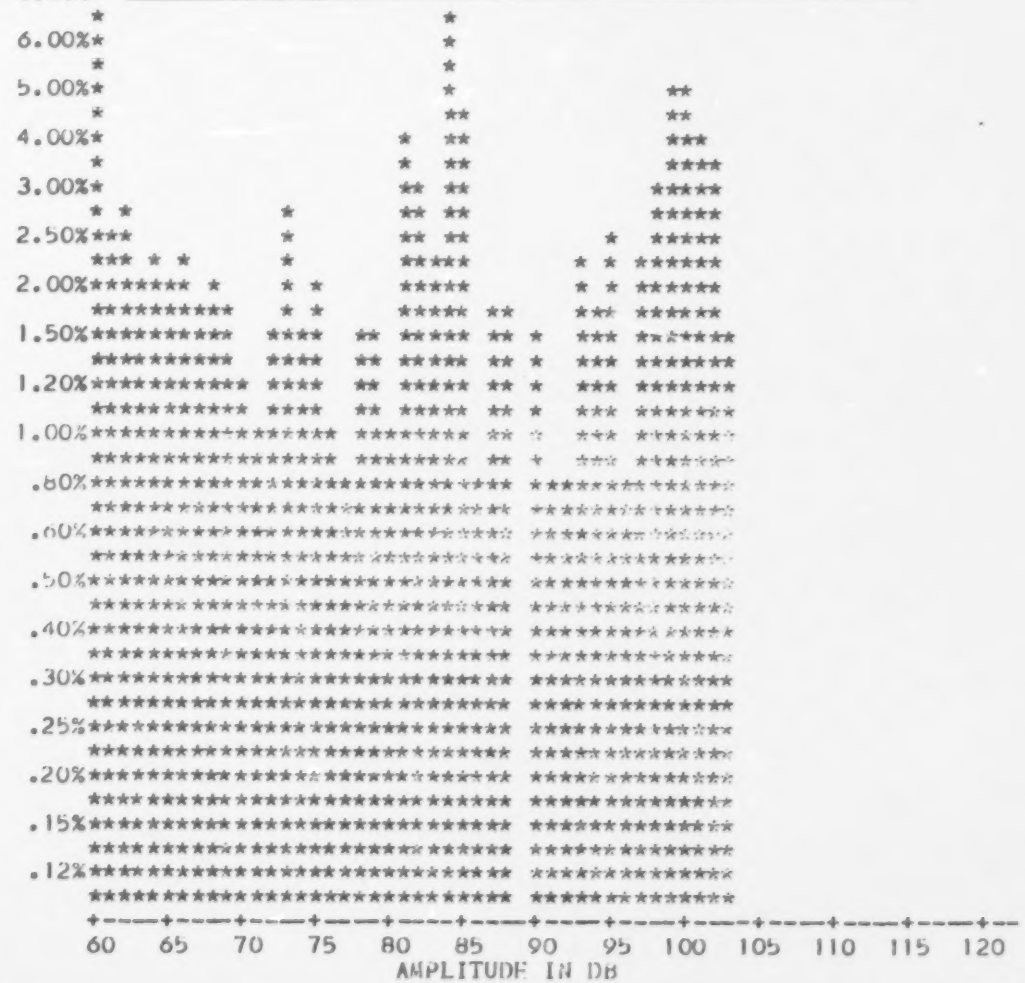
MIN. COMP. = 60 DB MAX. COMP. = 103 DB
ARITHMETIC MEAN = 76 DB
STD. DEVIATION = 15 DB
VARIANCE =225 DB

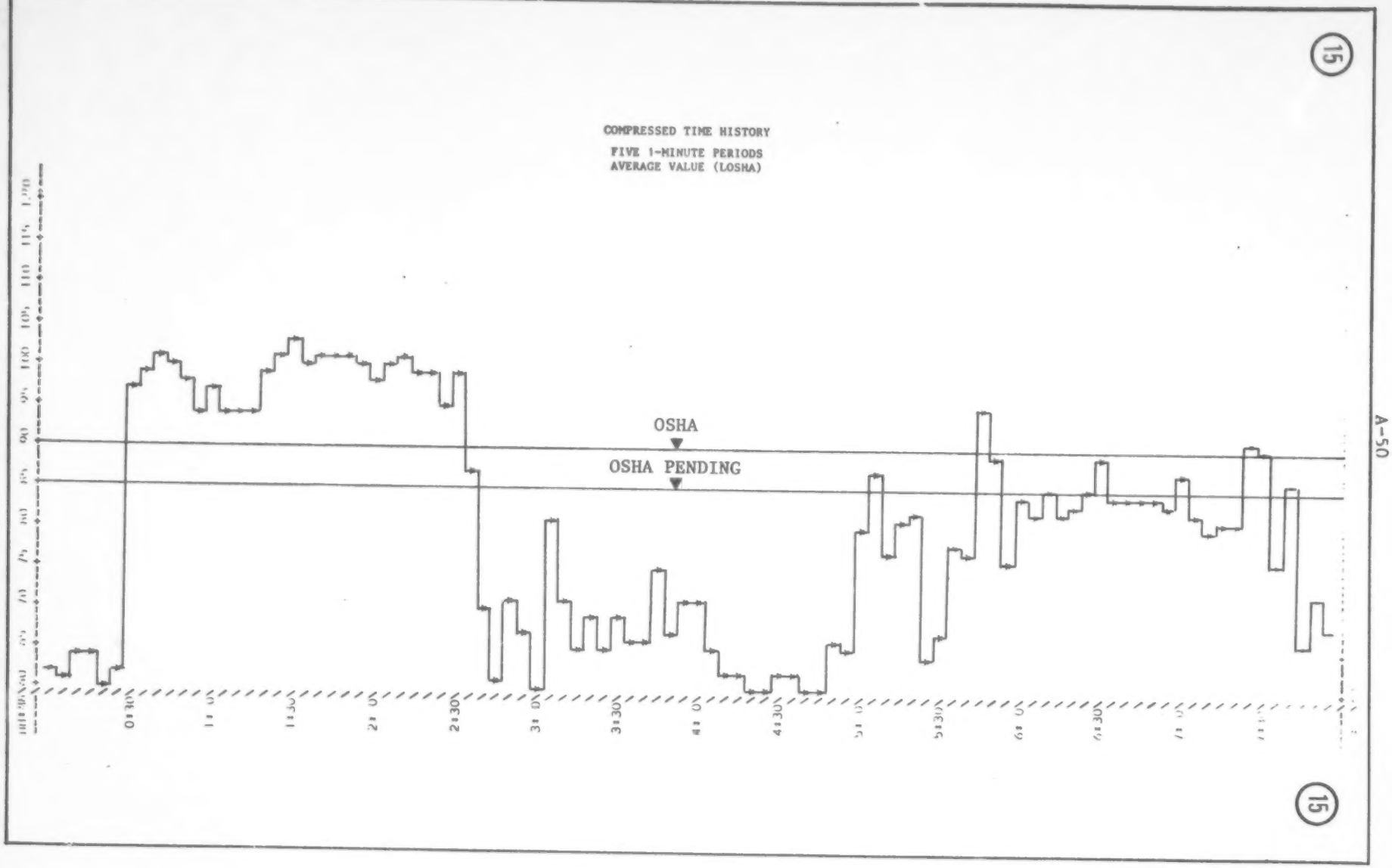
AMPLITUDE DISTRIBUTION

(19) (15)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
139	29.0	60 TO 64
39	8.1	65 TO 69
32	6.7	70 TO 74
27	5.6	75 TO 79
69	14.4	80 TO 84
34	7.1	85 TO 89
28	5.8	90 TO 94
55	11.5	95 TO 99
57	11.9	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




15
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
15

(16)

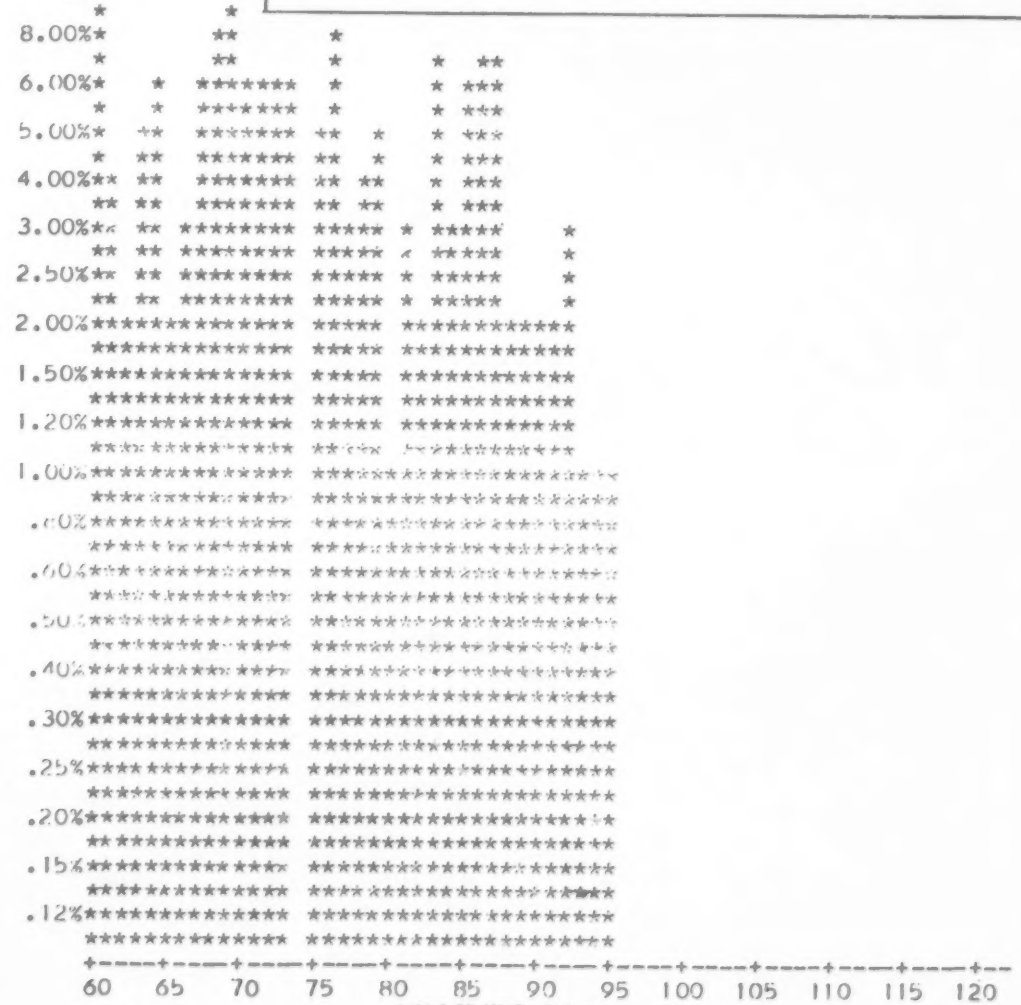
```
1  26  80  1221    60    64     4     1
110574        36955   153
63  61  68  61  69  76  79  80  67  60  60  63  60  64  60  61
63  60  66  71  75  67  66  67  75  73  81  72  73  72  72  76
71  72  70  70  63  72  71  67  68  64  60  60  64  68  64  72
75  75  70  65  69  63  62  68  68  69  71  66  67  60  60  64
68  69  69  68  70  64  69  73  81  61  76  83  68  87  86  88
83  90  84  85  86  85  83  78  78  71  76  82  81  85  77  79
70  76  77  79  76  87  87  79  85  69  85  78  73  71  65  64
70  76  86  84  84  83  77  78  79  81  83  86  85  84  73  89
69  73  69  84  69  76  86  87  95  92  91  89  94  93  92  91
92  89  86  90  85  86  86  82  85  80  80  80  80  80  80  80
60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
```

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
353	73.5	60 TO 64
28	5.8	65 TO 69
24	5.0	70 TO 74
25	5.2	75 TO 79
16	3.3	80 TO 84
24	5.0	85 TO 89
9	1.9	90 TO 94
1	.2	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

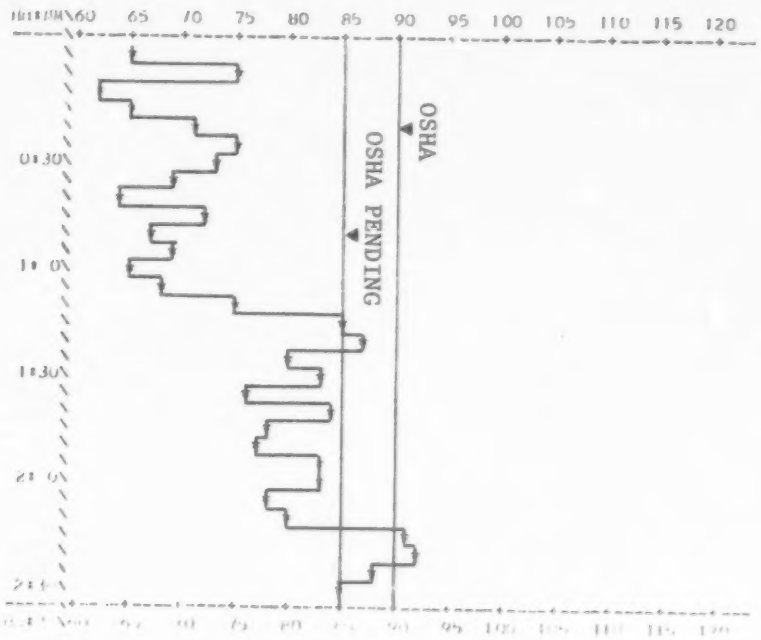


16

16

COMPRESSED TIME HISTORY
FIVE 1 MINUTE PERIODS

AVERAGE VALUE (LOSHA)



(17)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
1 26 80 1221 60 64 4 1
104 38754 161

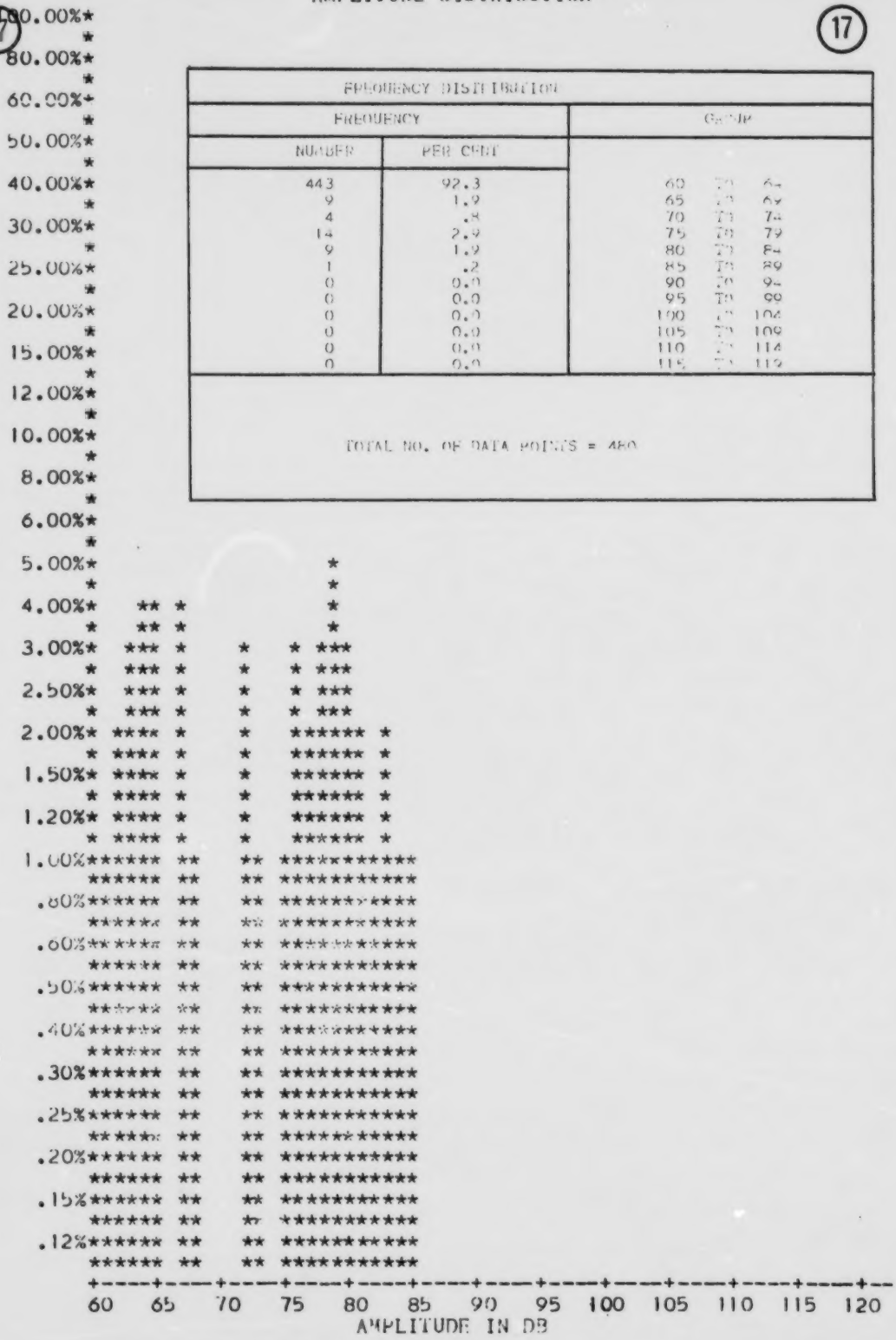
60	60	60	60	60	60	60	60	60	60	60	67	63	60	60	63
64	65	64	60	60	60	60	60	60	60	60	61	61	62	60	60
83	79	72	84	76	81	78	77	73	78	75	76	83	76	79	79
72	67	82	85	81	79	64	79	76	67	62	62	60	60	60	63
60	64	60	60	60	60	60	60	60	60	61	65	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60

AMPLITUDE DISTRIBUTION

(17) (17)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
443	92.3	60 TO 64
9	1.9	65 TO 69
4	.8	70 TO 74
14	2.9	75 TO 79
9	1.9	80 TO 84
1	.2	85 TO 89
0	0.0	90 TO 94
0	0.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

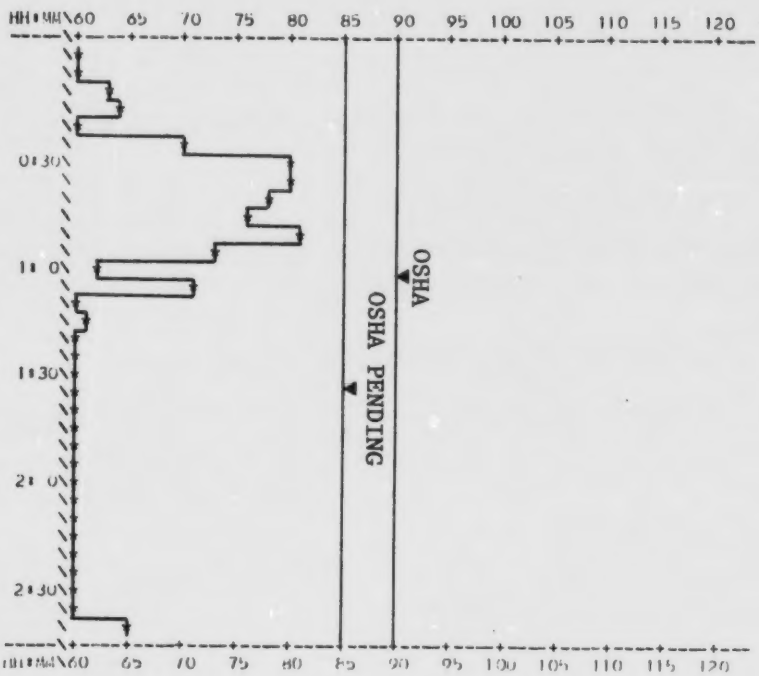
TOTAL NO. OF DATA POINTS = 480



(17) (17)

COMPRESSED TIME HISTORY
FIVE 1 MINUTE PERIODS

AVERAGE VALUE (LOSHA)



(18)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
 1  26  80  1222    60    64     4     1
    114     115200  480
 62  60  60  60  66  63  61  60  64  60  61  60  60  60  71  70
 77  78  61  75  61  66  66  60  63  64  72  71  70  74  66  61
 72  76  76  77  79  82  77  75  82  72  72  67  79  78  74  84
 76  77  68  74  75  76  74  78  75  78  65  65  74  64  64  68
 68  69  69  78  80  76  70  79  81  80  79  79  76  73  61  60
 61  67  66  60  71  68  63  70  75  66  69  69  76  73  67  67
 98  84  85  93  94  95  99  97  89  90  86  89  93  90  89  89
 92  93  91  97  87  76  93  92  86  90  92  91  91  85  87  88
 92  83  75  82  83  89  89  94  91  88  90  90  92  89  89 103
 94  93  79  77  73  76  80  81  81  77  74  66  85  93  94  93
 95 100 100  99 101 101 101  98 103 100  97  87  86  95  93  83
 90  86  84  88  98 102 107  95  82  82  91  92  97  99  89  92
 91  85  90  91  96  97 102 104 103  97  94  87  86  81  86  90
 89  86  92  88  94  96  90  92  92  89  93  94  97 100 106  96
 89  87  86  91 104 100  84  89  87  71  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  62  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 67  60  82  93  86  90  91  65  69  87  92  93  95  94  95  94
 94  95  95  94  84  66  70  77  80  81  92  88  89  90  94  91
 92  95  94  94 101 102  98  96 100 101 100 100 102 101 101 100
100 101 101  99 102 103 102 102 103 101 103 101  97 102 101  99
100 101  95  86  87  93  92  88  94  88  96 101  99 102  99 100
101 103 101 102 100  99  99  99  99  99 100 100  99  96  91  87
 83  95  92  90  93  90  92  90  99 100 102 101 100 100 101 100
%EOF


ENTER LOG DATE (DD/MM/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 00307
4199
ENTER USER CODE (4 CHARS) :
 ENTER J08 CODE (3 CHARS) : 213


   DATA LOGGED :12 SEPT 1979
        LOGGER : DR-301/26
 SERIAL NUMBER : 1222
     CAPACITY  : 60 K
 SYNC TO CAL   : 64 DB
 SAMPLING RATE :  4/SEC
 TEST DURATION =   1 :  0

DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 00307
     J08 CODE : 213
  USER CODE   : 4199
  CHANNEL     : 80
TOTAL SAMPLES =  115200
 SETUP FILE   =    08 07 0


          TIME HISTORY ANALYSIS

 SOUND EXPOSURE LEVEL (S.E.L.) CALCULATIONS
 ARE BASED ON THE FOLLOWING:
 LOG, DB = 10 D / 10
 FACTOR (= 10 LOG 1/T)  =
 CRITERION (CRITERION L.E.) =
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

 CH          LOG                          LOG
 NUM.      ENERGY      ENERGY/HR        ENERGY      ENERGY/HR
   1        73.0        73.0           1.19E+07    1.19E+07
   2        82.7        82.7           1.90E+08    9.07E+07
   3        77.6        77.6           5.72E+07    5.72E+07
   4        80.6        80.6           1.14E+08    5.69E+07
   5        83.0        83.0           1.99E+08    5.69E+07
   6        80.0        87.3           9.95E+07    5.69E+07
   7        94.0        94.7           2.49E+09    1.43E+09
   8        93.7        91.0           2.34E+09    1.14E+09
AIR. COMP. =  60 DB                  MAX. 20 OCT. = 107 DB
ARITHMETIC MEAN =  78 DB
STD. DEVIATION =  10 DB
VALIDITY = 100 %
```

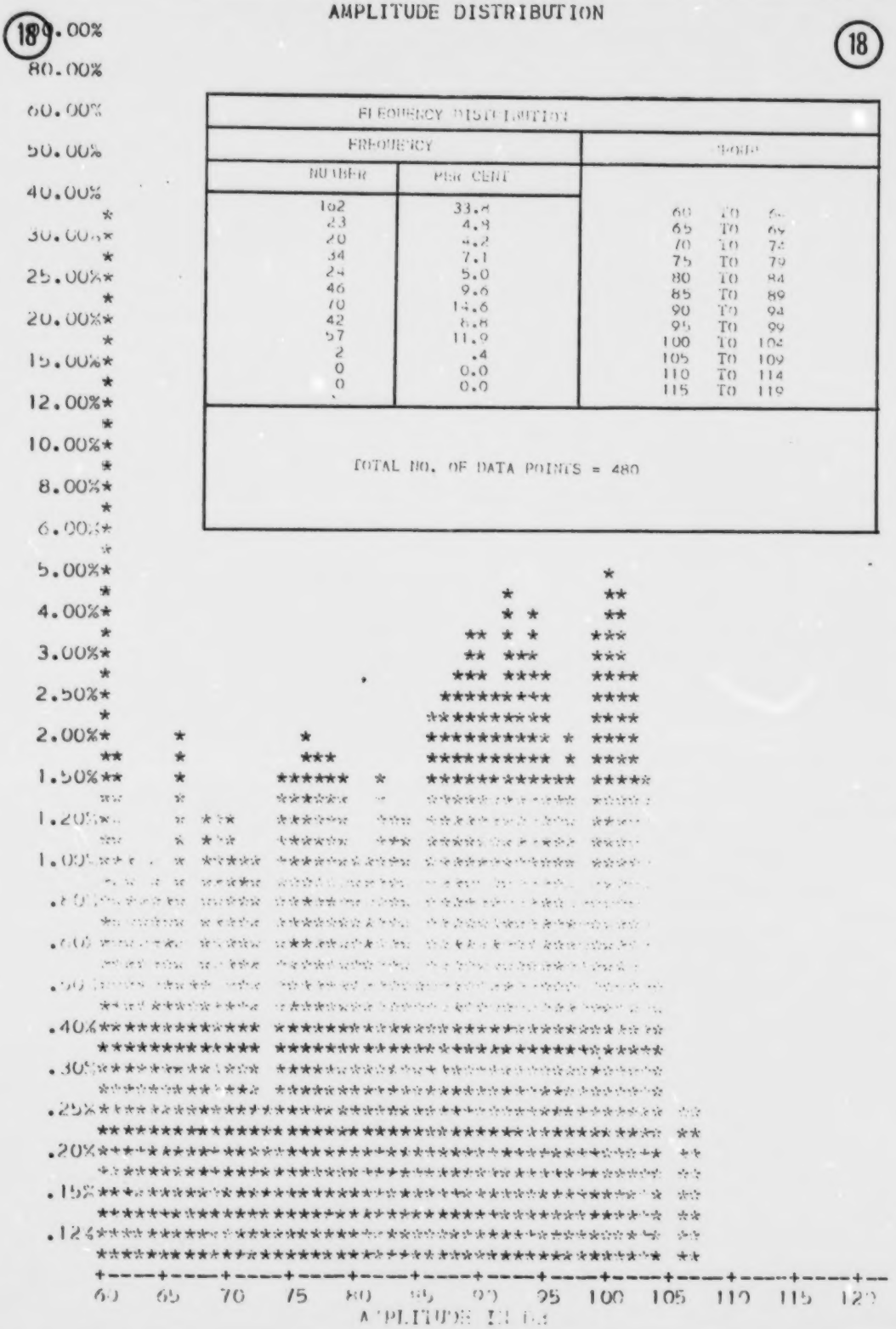
(18)

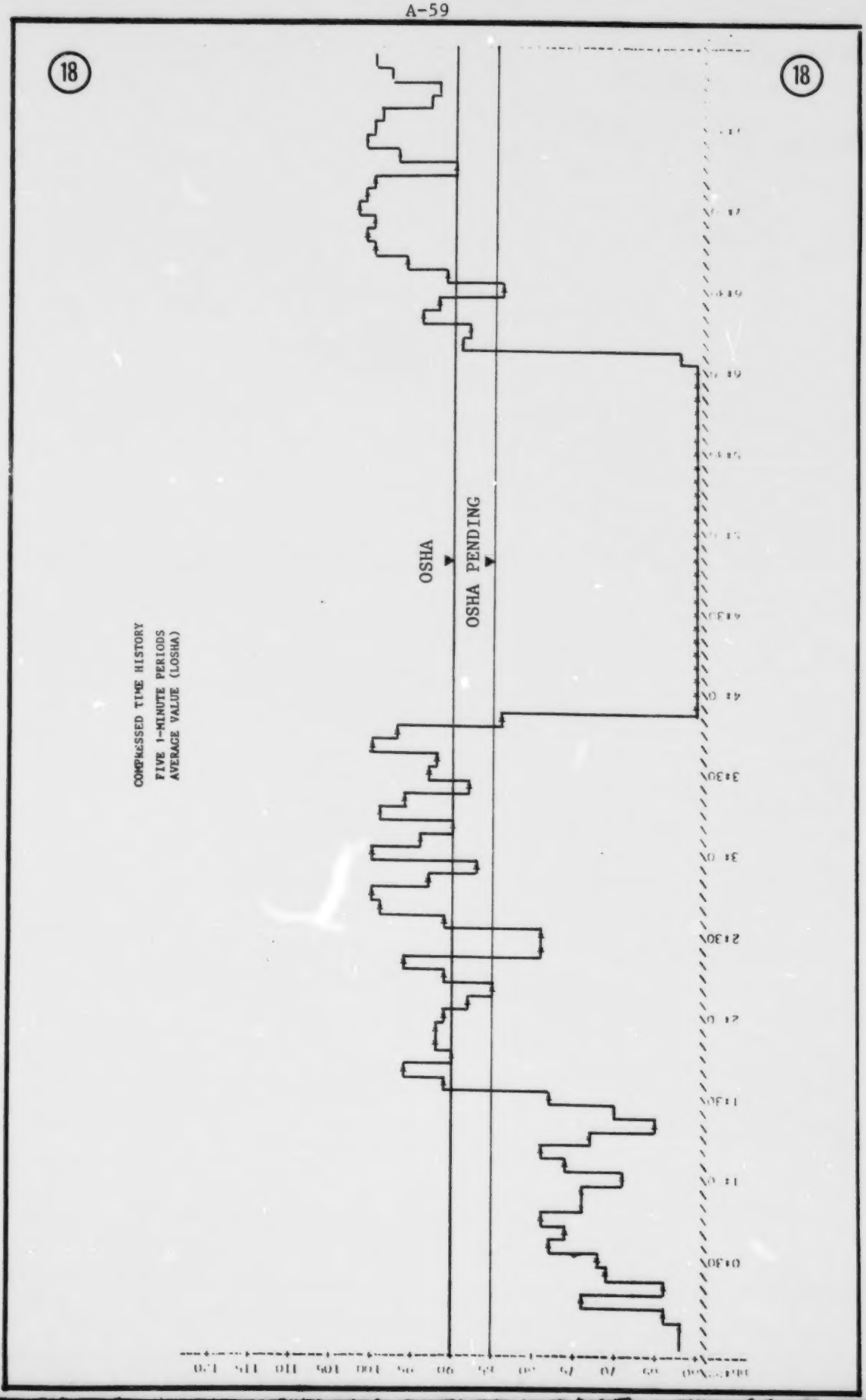
AMPLITUDE DISTRIBUTION

(18) (18)

FREQUENCY DISTRIBUTION		
FREQUENCY		BAND
NUMBER	PER CENT	
162	33.8	60 TO 64
23	4.8	65 TO 69
20	4.2	70 TO 74
34	7.1	75 TO 79
24	5.0	80 TO 84
46	9.6	85 TO 89
70	14.6	90 TO 94
42	8.8	95 TO 99
57	11.9	100 TO 104
2	.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




18
18
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(19)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1216   60   64    4    1
     27      115200  480
 60  61  69  61  69  61  60  60  65  60  60  60  61  60  60  60
 60  60  60  67  72  72  62  73  66  68  72  70  71  69  75  72
 72  67  66  74  72  75  64  77  78  71  69  76  82  77  69  64
 68  71  66  63  69  67  68  70  69  73  63  69  71  64  54  75
 64  60  60  72  73  73  74  75  72  68  67  64  70  64  67  67
 61  66  62  62  69  64  75  68  66  60  60  60  60  61  60  60
 71  65  72  77  69  70  77  86  88  88  92  83  94  89  91  92
 91  91  92  91  92  94  97 100  91  90  86  77  75  81  65  77
 82  82  83  73  69  80  71  62  64  68  66  71  80  72  76  77
 65  72  73  75  70  85  86  84  81  82  90  95  98 103 100  96
100 100 100  91  91  81  87  89  87  87  84  92  97  96  92 101
101  87  92  80  72  83  96  98  80  81  81  77  67  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  62  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  64  82  84  86  86  87  88  94  93
 94  93  92  77  74  69  81  93  83  87  88  87  87  81  81  86
 87  87  88  87  87  87  89  88  88  86  86  89  91  88  90  86
 78  88  89  88  84  89  84  97  93  96  95  92  92  92  92  91
 90  95  95  87  85  87  84  84  85  94  88  93  96  98  97  96
 97  97  92  90  92  81  85  95  99  95  95  99 100  91  90  86
 79  87  93  94  98  97  93  92  98  97  97  95  97  95  97  96
 95  90  97  95  95  91  92  86  71  83  80  75  83  91  95  92
 95  94  96  97  99  96  97  96  97  92  83  85  84  88  88  81
 68  60  60  60  60  65  62  60  64  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
```

(19)

```
ENTER LOG DATE (DD/MM/YR) : 13/09/79
ENTER SITE CODE (5 CHARS) : 00307
ENTER USER CODE (4 CHARS) : 4277
 ENTER JOB CODE (3 CHARS) : 213
```

```
   DATA LOGGED :13 SEPT 1979
      LOGGER : GB-SOUTH
      SITE CODE : 00307
      USER CODE : 4277
      JOB CODE : 213
      TOTAL SAMPLES = 1215
      SAMPLE RATE = 60 S
      CHANNELS = 8
      DATA FORMAT = 4/SEC
      DATA COMPRESSED = NO
```

```
DATA ANALYZED : 27 SEPT 1979
```

```
        TIME HISTORY ANALYSIS

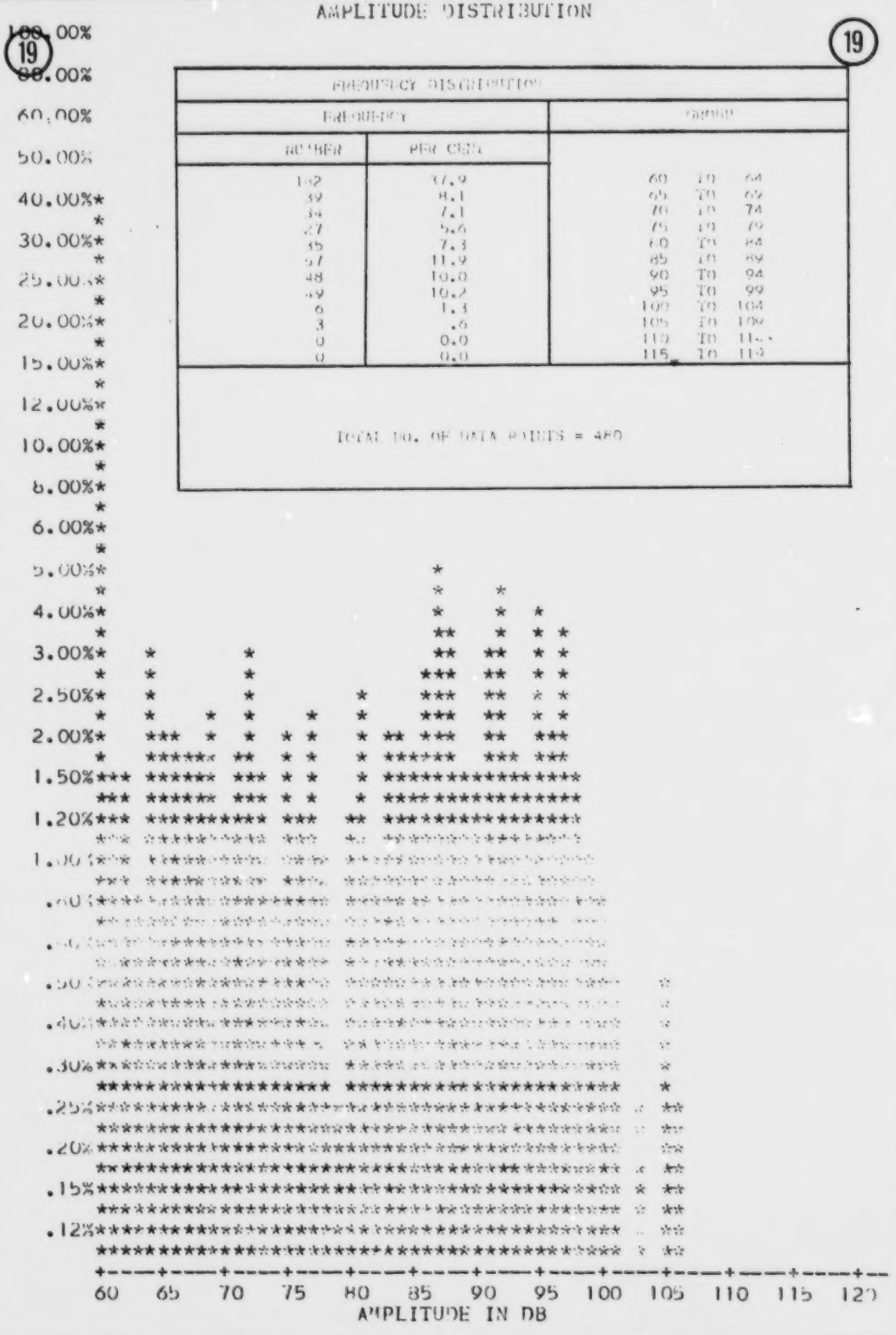
      ANALYSIS OF CHANNEL 1 (Ch.1) CALCULATED
      SAMPLE RATE = 60.00 PER 1 S
      DATA FORMAT = 4 / SEC
      TRANSDUCER (CHANNEL) LEVEL = 60.00
      NUMBER OF COMPUTATIONS = 480
      PERIOD = 1 MINUTES

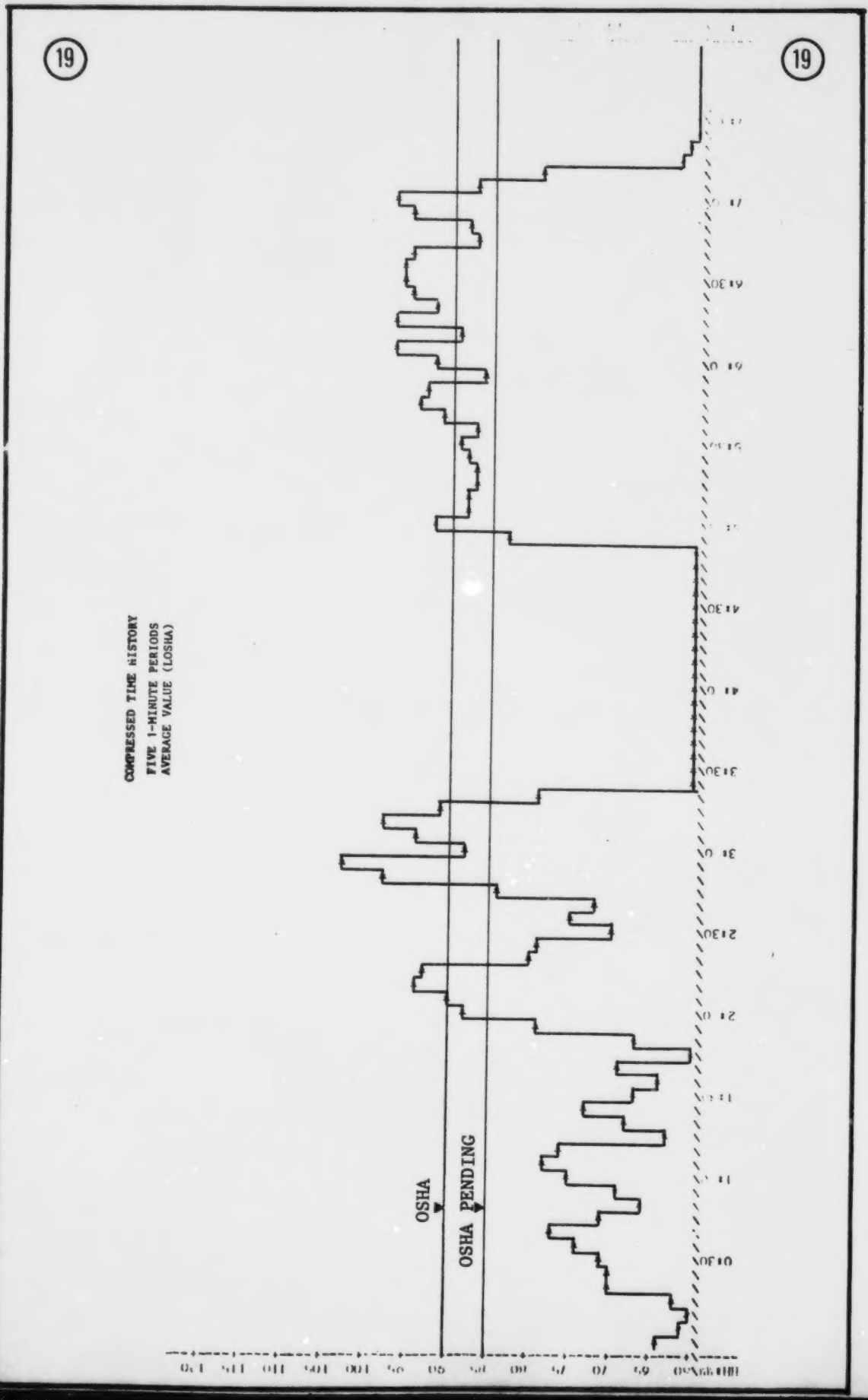
 CL          FREQ.                          PSD
 ORDER    CUMULATIVE    INCREMENTAL     CUMULATIVE    INCREMENTAL
    1        69.6          69.6          .140          .14
    2        71.1          71.9          1.053         1.19
    3        91.9          84.9          15.673        14.62
    4        95.2          94.9          24.129        23.77
    5        96.0          96.4          .995          24.12
    6        89.6          92.9          11.753        35.93
    7        93.9          97.1          .81.          56.3
    8        91.0          99.6          3.476         6.2
 MIN. CORR. = 50.00                     MAX. CORR. = 100.00
 SAMPLE TIME = 7.00 MIN
 NO. OF PERIODS = 12
 FILTER = NONE
```

AMPLITUDE DISTRIBUTION

(19) (19)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
182	37.9	60 TO 64
39	8.1	65 TO 69
34	7.1	70 TO 74
27	5.6	75 TO 79
35	7.3	80 TO 84
57	11.9	85 TO 89
48	10.0	90 TO 94
49	10.2	95 TO 99
6	1.3	100 TO 104
3	.6	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




19
19
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

20

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80   1225    60    64     4     1
      79      115200   480
 61  60  60  60  60  60  60  67  60  61  64  61  63  65  63  64
 60  61  67  60  64  60  60  60  61  62  61  64  65  65  61  63
 81  94  88  89  88  88  88  92  89  89  91  96  99  98  94  94
 86  97  94  96  96  99  96  96  97  95  88  87  94  95  96  99
102  96  94  94  97  96  93  98  94  90  91  97  91  96  98  95
 94  89  97 102  98  94  90  95  96  96  88  96  99  96  96  96
 96  96  96  86  68  84  84  89  85  83  82  84  90  85  75  90
 95  95  98  96  97  97 100 103 102  99  98  99  98  86  89  93
 92  92  93  91  93  92  87  86  82  82  83  84  91  84  85  87
 83  75  80  81  77  77  82  84  79  71  74  76  93  97  85  86
 84  87  92  93  94  95  96  98  98  99  89  84  92  81  71  84
 66  60  60  65  68  85  83  89  91  83  95  94  93  94  95  96
 98  98  97  98  98  95  83  73  78  78  77  80  77  84  82  79
 83  94  96  97  96  99  96  96  96  97  97  97  96  93  79  92
 82  81  82  84  80  83  88  94  97  97  98  96  93  93  96  96
 99  95  94  94  95  96  96  95  95  95  97  91  88  82  79  79
 74  79  71  69  69  73  81  94  95  95  95  98  95  96  92  86
 86  90  91  92  92  88  91  85  75  73  75  79  83  92  95  95
 96  95  93  97  99  98  98  99 100 100  98  99  97  98  96 101
101 102  99  99  95  90  61  60  60  61  60  77  60  67  60  60
 60  71  60  65  68  80  64  60  62  64  60  75  60  60  60  60
 79  61  68  60  61  60  73  65  67  60  73  73  66  62  60  68
 60  95  97  96  94  98  93  84  87  85  83  83  84  90  89  90
 91  91  84  82  82  83  85  82  82  81  80  79  79  84  83  80
 83  76  80  85  86  94  81  80  94  85  90  76  77  78  84  77
 83  77  87  99  98  83  77  81  83  82  84  82  83  83  82  93
 89  88  90  87  89  87  87  84  85  86  88  91  93  96  90  94
 96  97  96  95  94  93  96  96  98 100  96  92  96  95  93  96
 93  92  94  96  96  93  92  91  73  75  82  85  85  85  85  89
 99  99 100  99 100  99 102 103 101  99  99  99  98  98  74  63
/EOF
```

20

```
ENTER LOG DATE (DD/MM/YR) : 16/08/79
ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 4806
 ENTER JOB CODE (3 CHARS) : DUX
```

```
   DATA LOGGED :16  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 00000
SERIAL NUMBER : 1225                        JOB CODE : DUX
      BASELINE : 60 DB                     USER CODE : 4806
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STABLEY TIME =   0: 0:19
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	10*LOG		10**	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	88.2	88.2	9.751	9.75
2	95.0	92.4	25.129	34.88
3	90.6	91.8	13.568	48.45
4	92.9	92.1	18.654	67.10
5	93.3	92.4	19.739	86.84
6	88.4	91.8	9.992	96.83
7	86.4	91.3	7.619	104.45
8	94.9	91.9	24.810	129.26

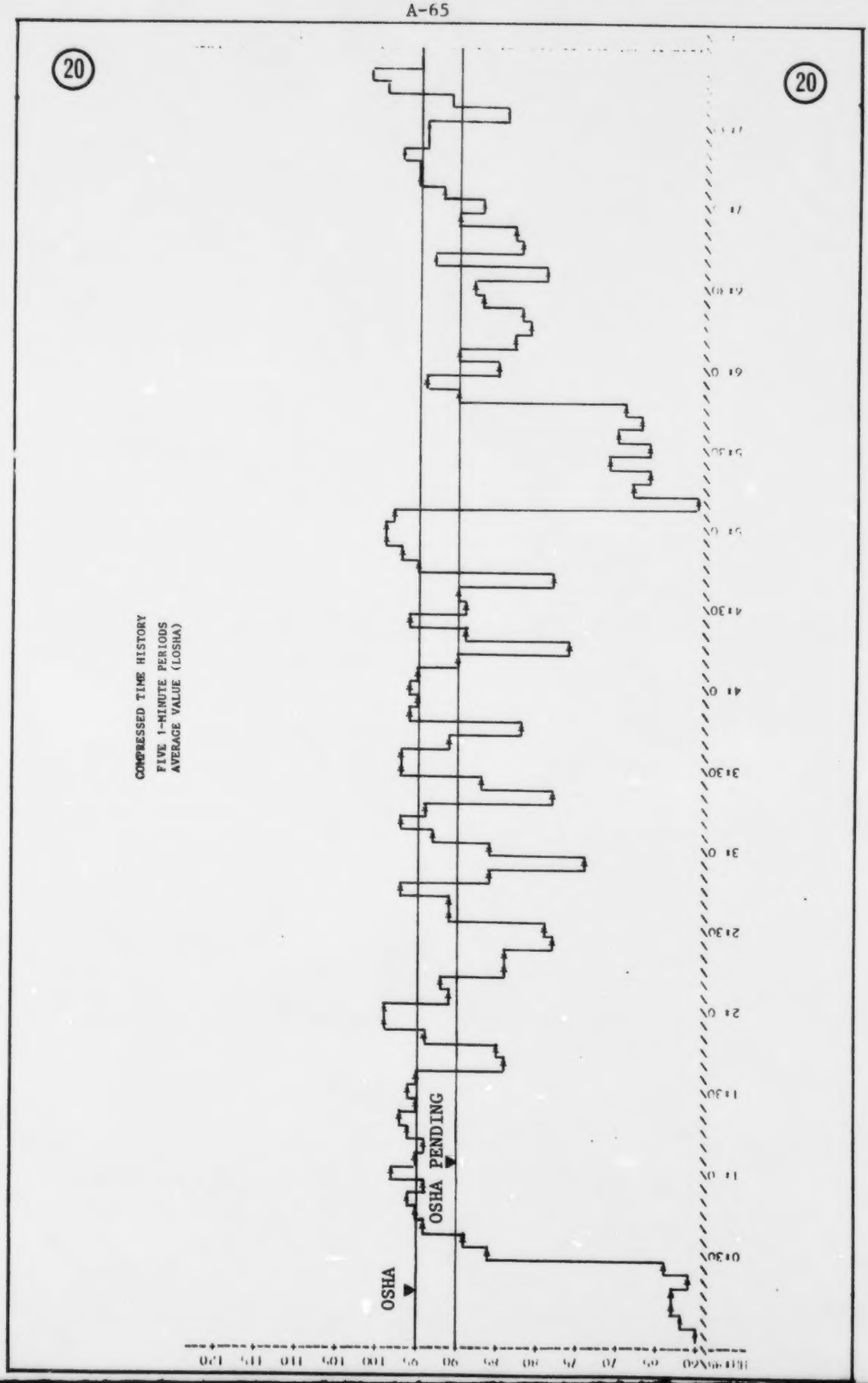
MIN. COMP. = 60 DB MAX. COMP. = 103 DB
ARITHMETIC MEAN = 85 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

(20)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
57	11.9	60 TO 64
19	4.0	65 TO 69
14	2.9	70 TO 74
31	6.5	75 TO 79
70	14.6	80 TO 84
56	11.7	85 TO 89
79	16.5	90 TO 94
138	28.8	95 TO 99
16	3.3	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

(20)


20
20
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
24:00
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

(21)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

1 26 80 1217 60 64 4 1
427 115200 480

60	60	60	60	60	60	60	61	67	65	63	60	60	60	60	60
61	60	64	73	60	62	71	69	66	66	68	71	66	60	67	60
62	61	69	62	65	66	60	67	88	98	92	92	93	96	100	94
98	98	95	70	76	93	100	96	99	93	81	82	81	84	87	83
84	83	94	98	94	95	96	101	99	96	89	80	74	80	81	74
83	97	100	101	97	98	98	97	92	90	95	97	92	73	71	80
82	91	96	97	95	90	86	89	88	85	90	88	91	96	96	88
98	99	101	91	92	95	96	96	92	80	92	93	70	74	88	89
95	93	97	102	101	101	96	83	77	86	98	97	98	97	96	90
91	90	90	95	88	91	95	93	93	88	87	84	83	86	84	84
80	76	76	73	78	82	83	80	69	74	72	68	66	61	83	83
77	66	88	86	84	91	80	83	82	83	79	82	84	78	64	69
87	76	76	82	81	83	87	81	81	81	85	96	92	94	93	94
95	94	97	98	86	81	70	73	84	76	70	71	72	74	71	72
87	98	97	96	86	76	73	72	78	72	71	71	73	83	84	86
88	84	85	91	96	96	97	96	94	95	94	94	95	95	88	91
97	103	92	90	89	82	84	83	72	76	72	61	63	72	67	61
83	96	97	99	98	99	97	97	98	98	91	77	75	75	74	76
79	82	85	86	86	86	86	84	82	85	85	82	83	84	87	95
89	98	98	98	97	99	96	93	88	76	63	61	71	85	79	74
76	79	73	76	60	60	60	60	60	76	76	76	66	67	61	78
61	71	67	60	65	60	60	73	68	61	63	69	79	74	60	60
60	60	74	62	67	77	95	94	90	85	89	91	93	96	98	101
95	94	94	95	92	71	77	82	94	94	95	96	101	99	99	97
100	99	98	90	86	74	76	82	81	82	83	84	87	88	82	90
92	82	85	88	86	83	84	82	86	84	94	95	90	87	86	95
91	96	92	95	98	96	95	95	94	91	96	97	103	99	96	88
97	97	95	95	97	96	86	91	92	92	94	94	96	94	96	92
92	87	81	88	90	86	82	83	83	93	96	98	96	97	98	98
100	101	100	99	99	101	102	98	95	83	68	62	65	67	74	70

EOF

(21)

ENTER LOG DATE (DD/MM/YR) : 17/08/79
ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 4754
ENTER JOB CODE (3 CHARS) : 211

DATA LOGGED :17 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1217
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 25 SEPT 1979
SITE CODE : ISHAF
JOB CODE : 211
USER CODE : 4754
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 1:46

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HR	LOGA		DOSE	
MODE	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.9	86.9	8.091	8.09
2	93.8	91.2	21.278	29.37
3	90.6	91.0	13.566	42.93
4	86.9	90.2	8.148	51.08
5	91.4	90.4	15.196	66.28
6	85.4	89.8	6.561	72.84
7	92.4	90.2	17.402	90.25
8	94.9	91.0	24.615	114.86

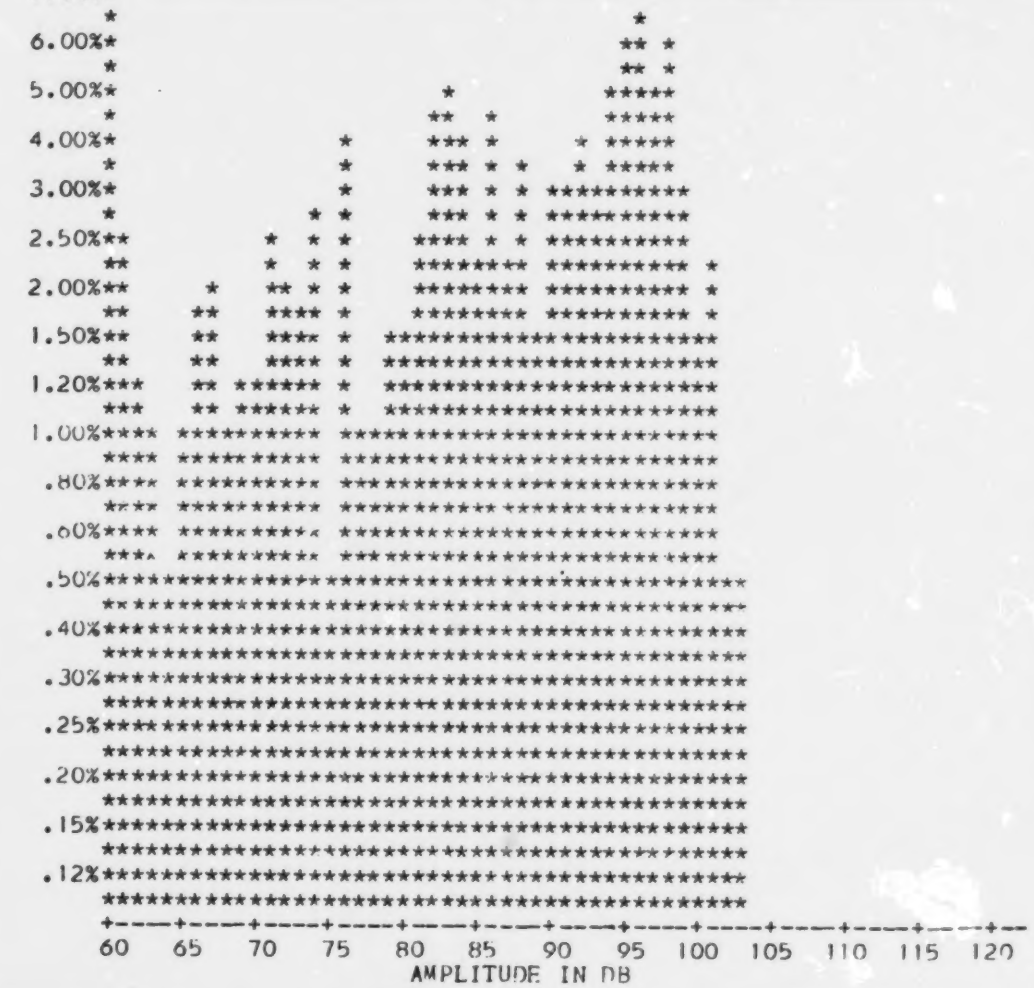
MIN. COMP. = 60 DB
MAX. COMP. = 103 DB
ARITHMETIC MEAN = 84 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

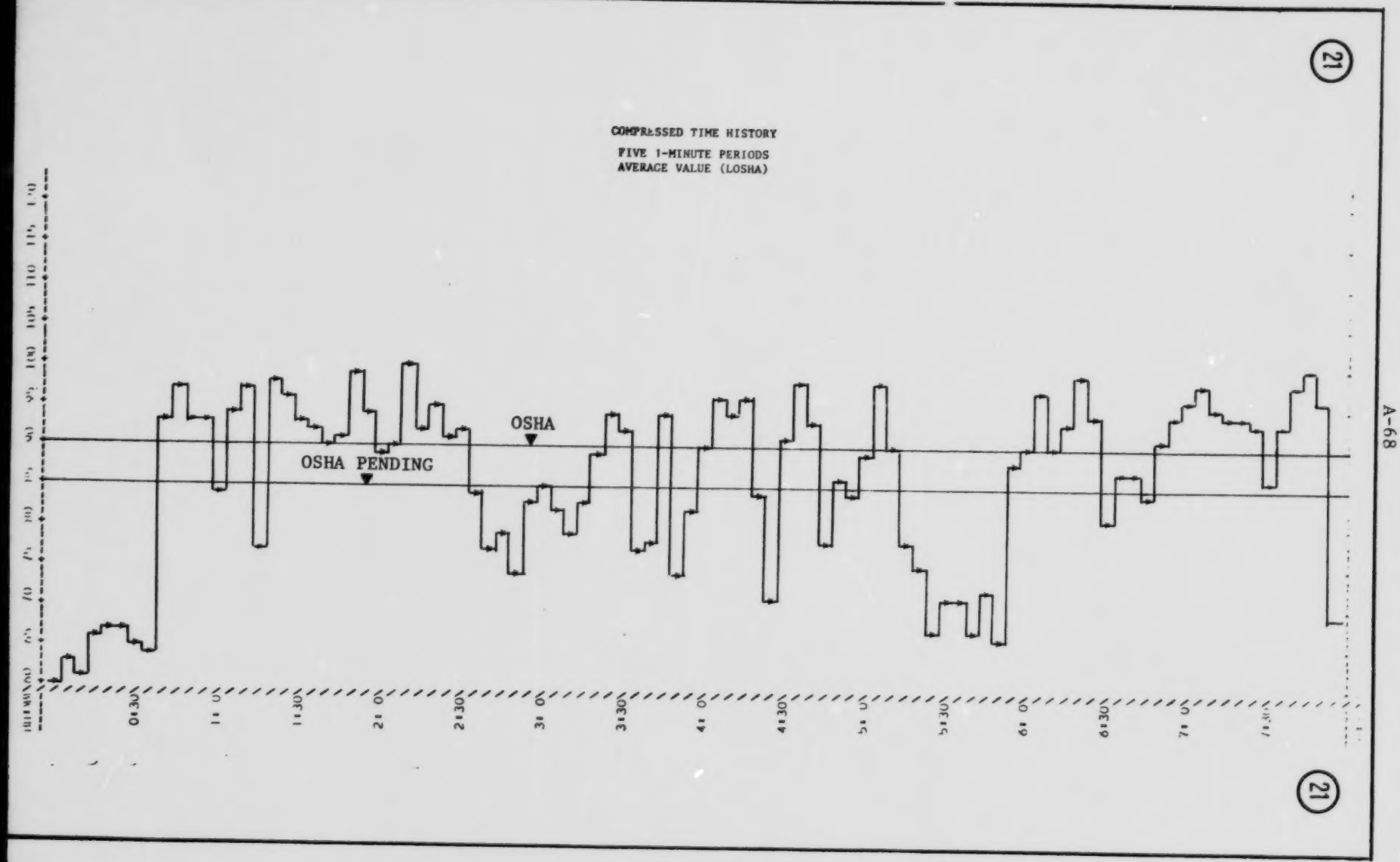
AMPLITUDE DISTRIBUTION

(21)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
51	10.6	60 TO 64
28	5.8	65 TO 69
41	8.5	70 TO 74
32	6.7	75 TO 79
69	14.4	80 TO 84
55	11.5	85 TO 89
73	15.2	90 TO 94
112	23.3	95 TO 99
19	4.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




21
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
21

(22)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214   60   64    4    1
     39     115200  480
 68  67  69  69  67  74  72  69  67  79  76  78  72  79  79  77
 73  80  76  69  72  66  73  76  78  70  66  72  71  63  61  66
 87 102 102 101  97 101 101 100 101  99 101 101 100  99 104 103
102 100  99  97  81  67  60  60  62  60  60  60  60  60  60  60
 60  60  61  60  60  60  60  60  60  60  60  60  61  60  60  60
 60  60  61  60  60  60  60  73  83  93  94  96  85  73  73  73
 89  92  95  96  92  92  94  91  85  93  95  97  96  94  91  91
 91  89  83  78  91  99  95  98  95  99  95  99  91  96  96  92
 73  71  62  92 101 103  99  97  89  95  96  97  98  96  98  95
 92  96  97  96  90  82  81  83  85  85  92  98  96  96  97  96
 94 103  99  99  93  95  95  94  99 100  96  93  96  99 103 100
 96  98  93  92  95  87  93  97 100  93  98  95  86  74  79  77
 72  80  75  74  84  90  97  98  97  93  95  91  85  85  86  86
 85  85  85  85  85  85  85  85  85  85  85  85  85  85  85  90
 85  97  95  85  95  96  93  90  90  89  80  80  90  96  93  92
100 100  98  98  98  94  93  88  83  86  86  89  97  98  97  98
 96  93  93  93  96  87  86  87  89  87  87  87  86  81  79  74
 78  76  81  82  83  83  82  80  80  80  77  77  81  83  83  86
 83  76  77  76  76  79  79  79  79  79  79  79  80  80  80  81
 87  77  75  60  60  60  60  60  60  60  64  71  89  98  96  99
 94  90  93  71  60  60  60  63  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  62  66  64  61  61  61  60  60  60  62  61  60  60
 71  60  61  80  90  94  94  73  62  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  64  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  79  94  98  98  84  62  61  60  75  69  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
$EOF
```

(22)

```
ENTER LOG DATE (DD/MM/YR) : 18/07/79
ENTER SITE CODE (5 CHARS) : CC201
ENTER USER CODE (4 CHARS) : 7519

 ENTER JOB CODE (3 CHARS) : 230
```

```
   DATA LOGGED :18 JULY 1979
        LOGGER : CE-301/26
 SERIAL NUMBER : 1214
     FACILITY : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION =  8  0  0

DATA ANALYZED : 14 SEPT 1979
     SITE CODE : CC201
     JOB CODE : 230
     USER CODE : 7519
     THRESHOLD : 60 DB
TOTAL SAMPLES =  115200
 STARTED AT   =     :  :
```

TIME HISTORY ANALYSIS

OCTAVE BAND SOUND LEVEL (O.B.S.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
DATA CODE = 60 DB / 64 DB
SAMPLING (DIGITIZED) RATE = 4/SEC
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME HOUR	LOWER CURRENT	LOWER CUMULATIVE	UPPER CURRENT	UPPER CUMULATIVE
1	92.8	92.8	18.421	18.42
2	88.5	91.0	10.213	28.63
3	96.4	93.5	42.366	68.99
4	90.9	92.9	14.242	74.94
5	89.7	93.4	11.955	86.89
6	80.8	91.3	3.510	90.40
7	73.1	90.3	1.200	91.60
8	76.7	89.5	1.976	93.57

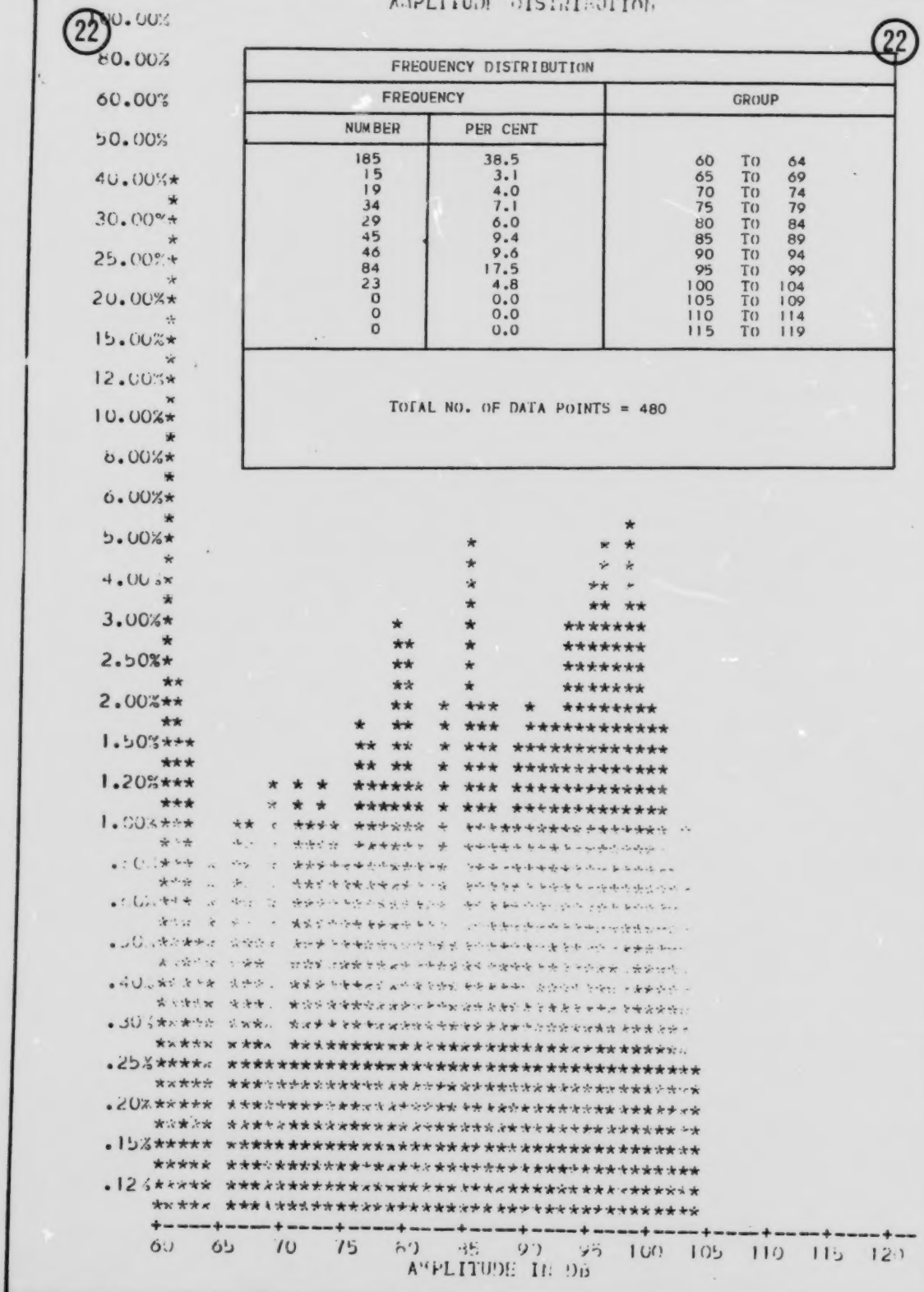
MIN. COMP. = 60 DB
ARITHMETIC MEAN = 77 DB
STD. DEVIATION = 15.08
VARIANCE = 230 DB
MAX. COMP. = 104 DB

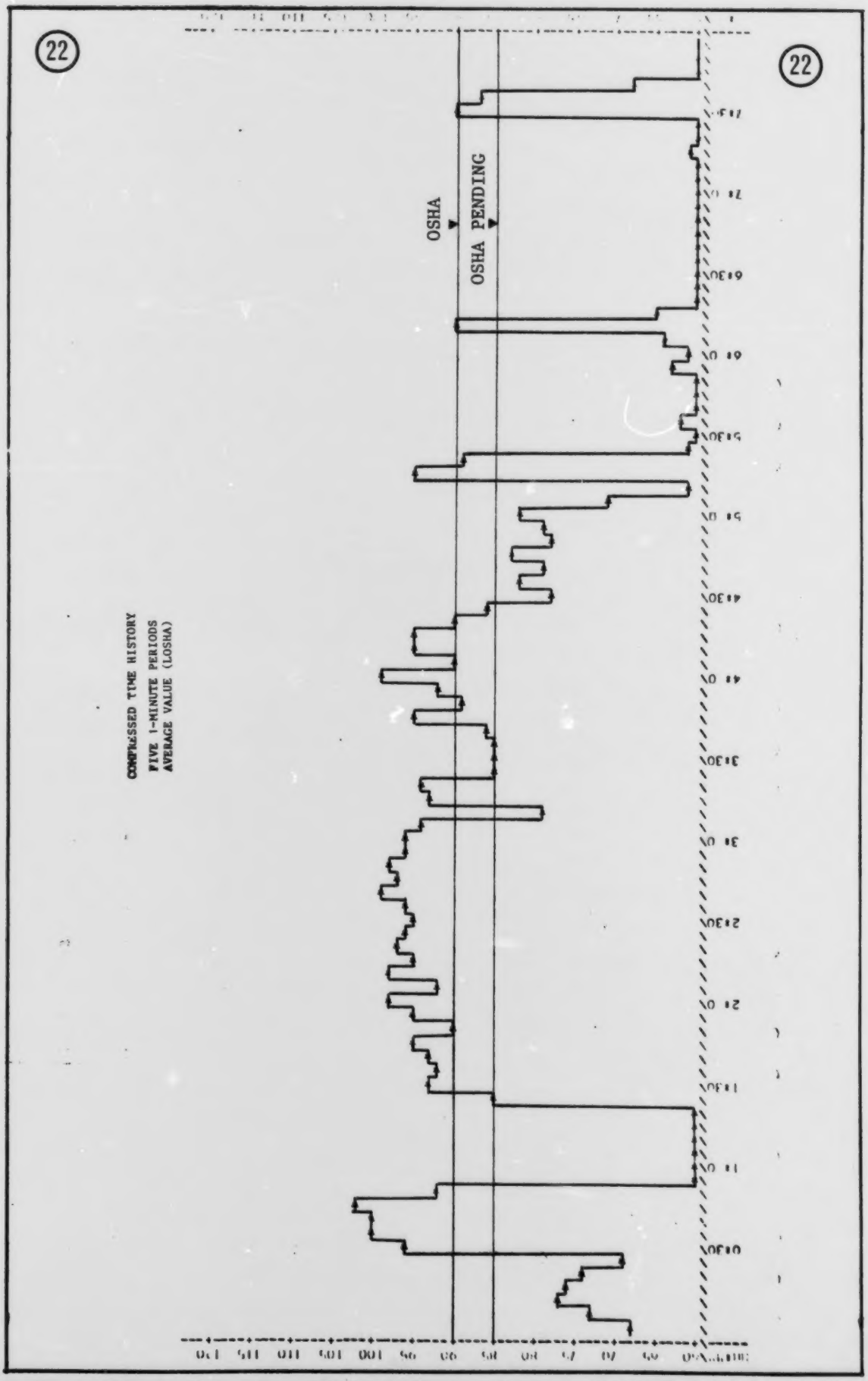
(22)

AMPLITUDE DISTRIBUTION

(22)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
185	38.5	60 TO 64
15	3.1	65 TO 69
19	4.0	70 TO 74
34	7.1	75 TO 79
29	6.0	80 TO 84
45	9.4	85 TO 89
46	9.6	90 TO 94
84	17.5	95 TO 99
23	4.8	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




22
22
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(23)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1218   60   64    4    1
   7008     115200  480
 60  60  60  60  60  60  60  60  60  61  60  60  60  60  61  60
 60  65  67  69  60  65  67  67  71  71  60  60  66  67  68  65
 68  61  69  62  76  87  92  93  91  87  89  95  91  87  81  85
 86  78  66  71  84  92  87  87  86  86  86  86  87  87  87  87
 87  87  88  88  88  87  87  87  87  100 107 106 104  96  71  71
 74  75  85  93 105 106 105 105 104 102 105 107 107  96 104 104
102  94  87  69  78  81  98 103 104 105 103 103 104 105 104  97
 97 104 106 105 106 103  99 106 106 106 105 103 103 101  99  78
 83  85  82  84  74  68  77  69  79  80  75  66  76  68  64  60
 66  60  61  65  78  90  84  82  80  81  82  79  81  81  77  75
 82  72  76  84  88  87  84  83  83  83  82  83  85  81  82  82
 82  81  85  86  81  84  84  75  78  71  62  80  83  77  80  79
 65  61  76  63  67  67  64  68  84  74  71  62  69  78  64  65
 66  60  60  60  73  61  60  60  60  62  60  60  74  60  65  66
 61  62  84  82  83  84  82  81  82  81  84  84  91  82  83  87
 73  64  75  71  65  66  60  62  63  72  70  73  60  73  68  60
 60  60  60  61  64  63  71  60  60  63  60  60  60  60  61  63
 63  65  65  64  76  60  66  71  60  60  61  65  60  75  68  62
 64  62  62  75  77  70  73  91  78  88  88  93  92 102 103 100
104 105 105 103 104 103 102  92  97  80  91  95  94  96  90  95
102  94  86  88  88  87  87  87  84  87  97  97  90  90  85  72
 72  71  90  94  91  91  99  89  80  81  81  80  75  77  83  93
 97  89  89  88  88  89  98  97  88  94  92  94  94  94  96  96
 93  95  93  90  97 101 104 105 105 105 106 106 106 105 103  96
104 107 107 106 107 103 107 108 105 102  99  97  97  95 106 107
106 107 104 102 104 107 104 105 103  94 101 105 105 105 109 102
102 103 107 107 106 105  99  97 105 107 104 108 105 104 104 101
107 106 101 103  97  99  90  97 107 107 107 107 104 101 103 108
106 106 104  93  98  93  98  96 107 107 108 107  99 100 101 102
108 108 106 105 105  98  74  69  60  70  65  60  60  71  67  69
%EOF
```

(23)

```
ENTER LOG DATE (DD/MM/YR) : 21/08/79
ENTER SITE CODE (5 CHARS) : 00301
ENTER USER CODE (4 CHARS) : 7929

 ENTER JOB CODE (3 CHARS) : 281
```

```
    DATA LOGGED :21  AUG 1979          DATA ANALYZED : 25 SEPT 1979
         LOGGER : DB-301/26                 SITE CODE : 00307
SERIAL NUMBER : 1218                        JOB CODE : 281
      BASELINE : 60 DB                      USER CODE : 7929
DYNAMIC RANGE : 64 DB                       THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STARTED TIME =  08:7:12
```

TIME HISTORY ANALYSIS

1/3rd OCTAVE BAND INDEX (O.B.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOGS EVERY # 30 DB / 2 DBS
EXCEEDANCE (CUTOFF) RATE = 5 %
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

BAND	10.mA		100 M	
NUMB	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	81.4	81.4	3.782	3.78
2	100.6	96.1	54.053	57.84
3	90.0	94.5	12.539	70.37
4	77.1	92.7	2.263	72.64
5	74.3	91.2	1.406	74.05
6	95.2	92.1	25.871	99.92
7	103.2	95.1	78.058	177.97
8	102.7	96.6	73.009	250.98

MIN. COMP. = 60 DB MAX. COMP. = 109 DB
ARITHMETIC MEAN = 84 DB
STD. DEVIATION = 16 DB
VARIANCE = 255 DB

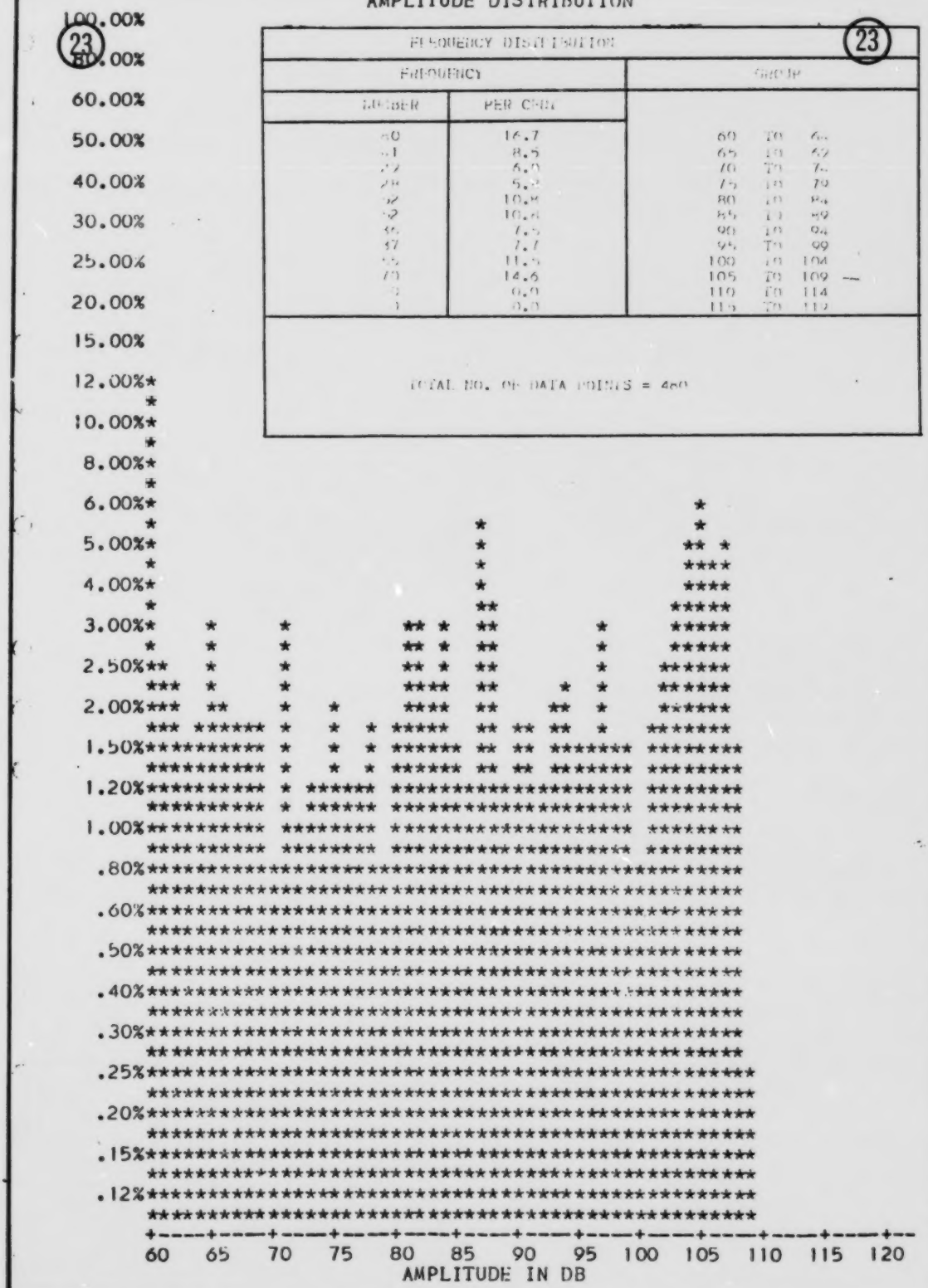
AMPLITUDE DISTRIBUTION

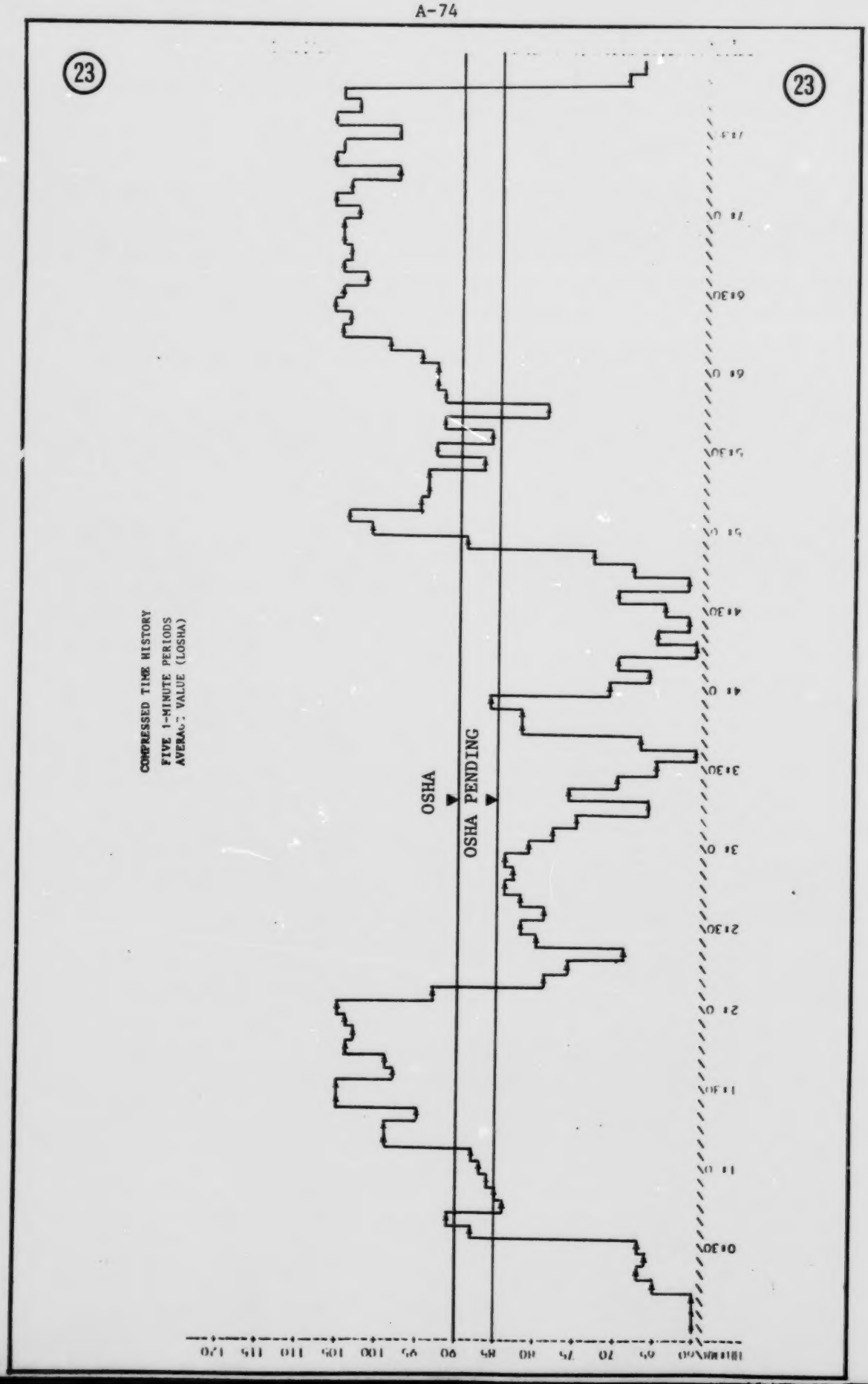
(23)

FREQUENCY DISTRIBUTION (23)

FREQUENCY		GROUP
NUMBER	PER CENT	
80	16.7	60 TO 64
41	8.5	65 TO 69
32	6.7	70 TO 74
28	5.8	75 TO 79
52	10.8	80 TO 84
52	10.8	85 TO 89
36	7.5	90 TO 94
37	7.7	95 TO 99
55	11.5	100 TO 104
70	14.6	105 TO 109
2	0.4	110 TO 114
1	0.2	115 TO 119

TOTAL NO. OF DATA POINTS = 480




23
23
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
dBA re 20 μPa
60
65
70
75
80
85
90
95
100
105
110
115
120

(24)

```
 1  26  80  1225   61   64    4    1
  .100      115200  600
 70  75  76  67  70  72  65  63  69  62  60  60  60  62  66  61
 63  60  63  60  61  62  92  90  91  90  94  92  91  89  90  90
 90  93  93  96  98 100  99  98  95 101 101 102 100  99  96  84
 85  92  97  92  91 100  97  96  95 102 100  96  93  93 101  95
 85  95 102  91  89  89  99  85  62  72  88  87  98  89  80  85
 93  95  93  92  89  95  90  90  93  91  87  94  94  77  96  93
 97  97  92  94  71  93  95  93  87  83  83 101 101 101 101 100
100 100 100  96  77  81 103 102  79  95 104 102  98 102 101  99
 95  97  92  89  92  96  97  93  85  92 101 100  96 100 101  95
 93 104  99 101  99  95 101 100  92 100 101 100  96  95 103 102
 92 101 102  94 104  94 100  96 102 102  96 100 102 101 103  99
 98 106 102 101 102  99 101 105 101  96 101 101  97 102 104  99
100 103  97  96 103 103 102 100  93  95  97 103 101 101 102 101
 95  98 103 101 102 100 100  95  95 101 103 102 101 104 106 104
103 104  95  88  97  95  92  91  95 101  72  99 103 103  96  86
 71  60  60  79  66  68  63  64  64  65  60  60  62  62  63  64
 72  71  61  61  60  71  72  79  75  80  80  96  96 102 101 105
102 100  98 104 103 100 102 100  97 102 102 102  98 101 102  99
101 104 103 101 101  98 102 103 101 101 101  95  96  97 103 101
101 100  97  97 103 102 103 101  92  85  96  94  96  95 103 103
102  98  95  96  94 100 103 100 101  95  95  96 101 101 102 100
101  96  93  95  97 104 100 101  92  95  97 103 101  99 100  97
 95 100 103 100 100  99  94  98 103 100 101  99  97  94 101 103
100 102  99  94  99 104 100 100  97  96  94  95  97 103 101  99
100  97  93 100 103 100 100  98  93  96  95  98  93 100  99  96
 99  94 101 103 100 102 101  96  94 102 102 101 101  98  94  97
 94  87  87  87  87  87  88  87  88  87  91 103 103 103 103 104
104 103  99  92 103  99  93  97  71  74  60  61  60  65  60  67
 60  64  63  61  65  66  65  60  60  60  60  56  67  63  69  60
 60  60  60  64  76  69  64  70  65  86  93  96  93  96  96  96
&EOF
```

(24)

```
ENTER LOG DATE (DD/MM/YR) : 11/07/79
ENTER SITE CODE (5 CHARS) : CC201

ENTER USER CODE (4 CHARS) : 4449
 ENTER JOB CODE (3 CHARS) : 271
```

```
    DATA LOGGED :11 JULY 1979                DATA ANALYZED : 12 SEPT 1979
         LOGGER : PS-301/26                       SITE CODE : CC201
  SERIAL NUMBER : 1225                            JOB CODE : 271
      LOCATION :                                  USER CODE : 4449
  ELEVATION(M) :                                  TAPE CODE :
 LATITUDE(DAT) :  47.63                     ZONE(DATUM) =    [illegible]
 LONGITUDE(DAT) =  -68  8  0                 SAMPLE RATE =    [illegible]
```

```
                    .IDB HEADER VARIABLES

 GEOG PARAMETER INDEX (0, .1) CALCULATIONS
 NO. CHANNELS IN THE POLARIZE =
 TOTAL TIME = 23.00 / 0.100
 ...  (CORRECTED) INDEX = 0.1
 ...  (CORRECTED) LEVEL = 0.10
 NO. OF GEOPOLARIZATIONS = 600
PERIOD =  1 MINUTES
```

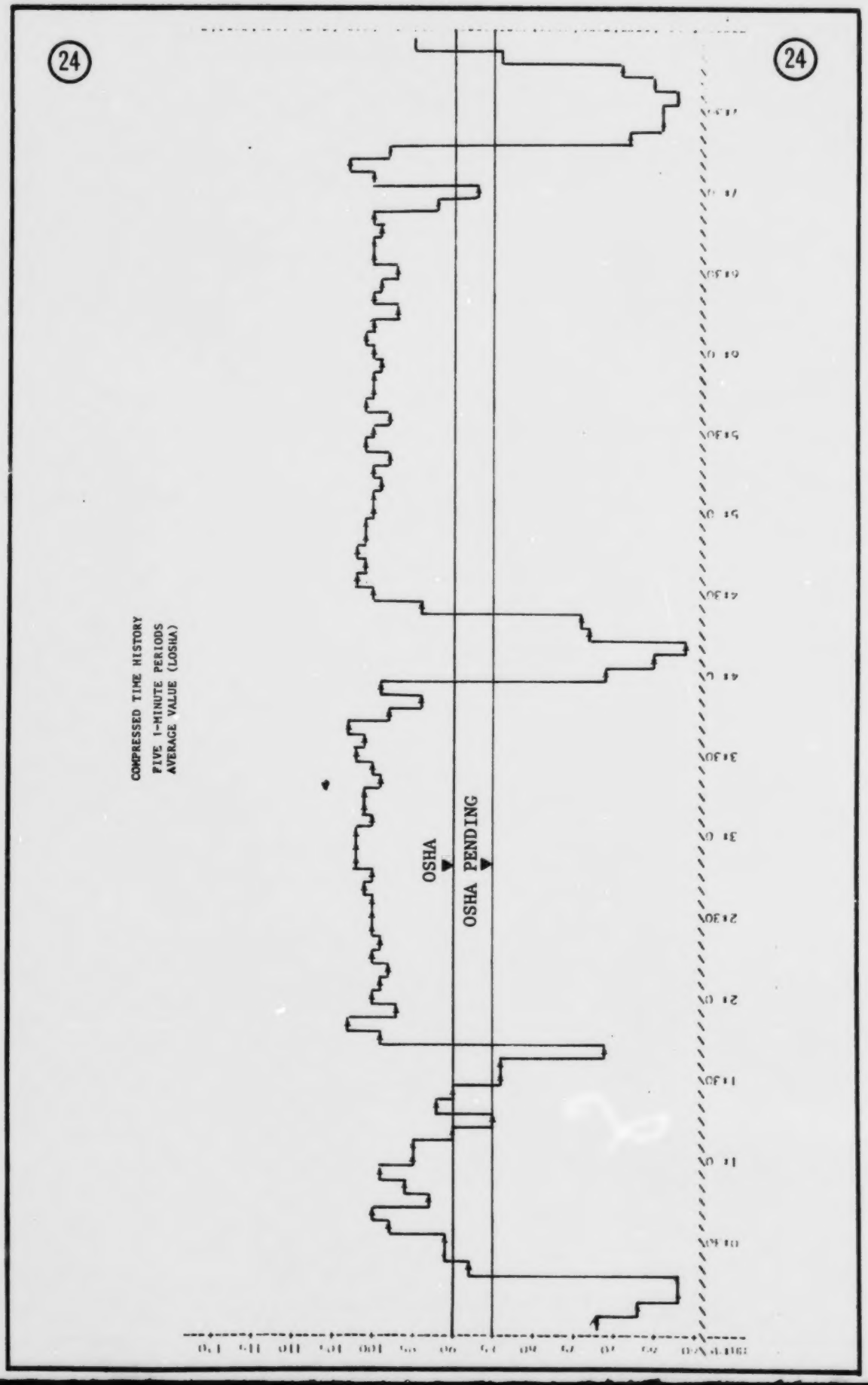
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	93.9	93.9	1.000	1.00
2	93.9	93.9	21.604	40.61
4	100.1	94.4	90.[illegible]	91.20
8	100.8	94.8	85.[illegible]	185.[illegible]
5	96.8	94.1	95.[illegible]	11.[illegible]
6	99.6	94.2	31.[illegible]	221.[illegible]
7	99.0	98.0	33.[illegible]	209.[illegible]
[illegible]	93.2	94.2	16.[illegible]	1.[illegible]

[illegible] [illegible] = 600.00 [illegible] = 1.00
APPROXIMATE MEAN = 91.00
[illegible] VARIANCE = 14.1
[illegible]

(24)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
48	10.0	60 To 64
22	4.6	65 To 69
14	2.9	70 To 74
10	2.1	75 To 79
6	1.3	80 To 84
33	6.9	85 To 89
51	10.6	90 To 94
119	24.8	95 To 99
171	35.6	100 To 104
6	1.3	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119
TOTAL NO. OF DATA POINTS = 480		

(24)


24
24
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(25)

PLACE TAPE IN READER AND TYPE / (SLASH) AND RETURN
1 26 01 1213 60 64 4 1
42 115200 480
66 63 62 60 60 60 61 60 60 61 60 64 60 60 62
69 60 69 71 72 60 61 73 75 74 60 60 75 80 61 76
76 93 75 65 75 74 62 60 61 60 61 61 63 87 62 79
81 91 94 104 103 88 82 76 91 66 61 66 67 68 60 60
60 61 60 60 60 60 60 60 60 59 74 65 70 76 73 93
92 90 73 90 93 83 75 84 84 69 62 62 65 64 60 62
62 66 66 69 72 74 66 87 102 86 72 69 86 84 85 90
91 96 66 83 80 86 92 86 83 87 68 91 86 86 85 86
89 95 103 98 83 100 102 89 90 92 87 88 91 80 102 102
92 87 82 76 78 86 84 79 83 80 84 79 80 83 84 86
81 81 70 78 86 84 83 81 84 89 88 78 88 88 89 88
87 84 82 83 87 95 95 91 81 80 81 80 80 80 80 80
60 60 60 60 60 60 60 60 60 60 60 60 60 60 61 60
60 60 60 60 75 78 64 70 86 84 88 81 85 74 71 78
71 65 76 74 77 60 60 60 60 60 60 60 60 60 61 60
61 60 60 60 60 60 63 63 65 61 60 60 61 60 62 61
60 60 60 60 60 60 60 60 60 60 60 60 60 62 60 60
60 60 60 60 60 60 60 60 61 75 70 74 81 79 62 60
60 60 64 64 63 61 61 61 60 60 60 60 65 63 60 62
60 60 60 60 62 60 60 60 60 60 61 60 63 60 60 60
60 77 60 60 60 75 66 79 70 60 60 60 60 64 73 76
61 67 72 97 90 90 81 62 60 64 72 60 67 67 64 92
98 76 62 85 85 84 84 73 71 77 78 81 77 78 79 80
76 80 77 83 71 69 60 75 78 60 64 75 63 60 60 60
60 66 69 66 64 64 74 77 83 80 78 83 86 87 84 87
88 91 88 82 82 89 82 82 83 84 81 84 84 85 84 81
81 80 81 82 82 82 93 103 104 100 92 97 102 105 106 102
98 93 105 104 99 86 82 81 93 91 75 70 60 60 63 60
60 60 60 60 60 62 60 60 60 60 61 78 63 67 67 71
64 65 66 69 60 60 60 60 60 61 79 69 72 73 67 65
%EOF

(25)

ENTER LOG DATE (DD/MM/YR) : 13/07/79

ENTER SITE CODE (5 CHARS) : CC210

ENTER USER CODE (4 CHARS) : 7203
ENTER JOB CODE (3 CHARS) : 211

(6)

DATA LOGGED :13 JULY 1979
LOGGER : 93-3G1/26
SERIAL NUMBER : 1213
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 12 SEPT 1979
SITE CODE : CC210
JOB CODE : 211
USER CODE : 7203
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:10

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGNA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	83.5	83.5	5.054	5.05
2	84.4	84.0	5.773	10.83
3	90.2	86.7	12.826	23.65
4	77.5	83.2	2.197	25.85
5	64.5	83.7	.366	26.22
6	79.2	83.2	2.807	29.02
7	80.6	83.1	3.410	32.43
8	92.0	84.8	16.527	48.96

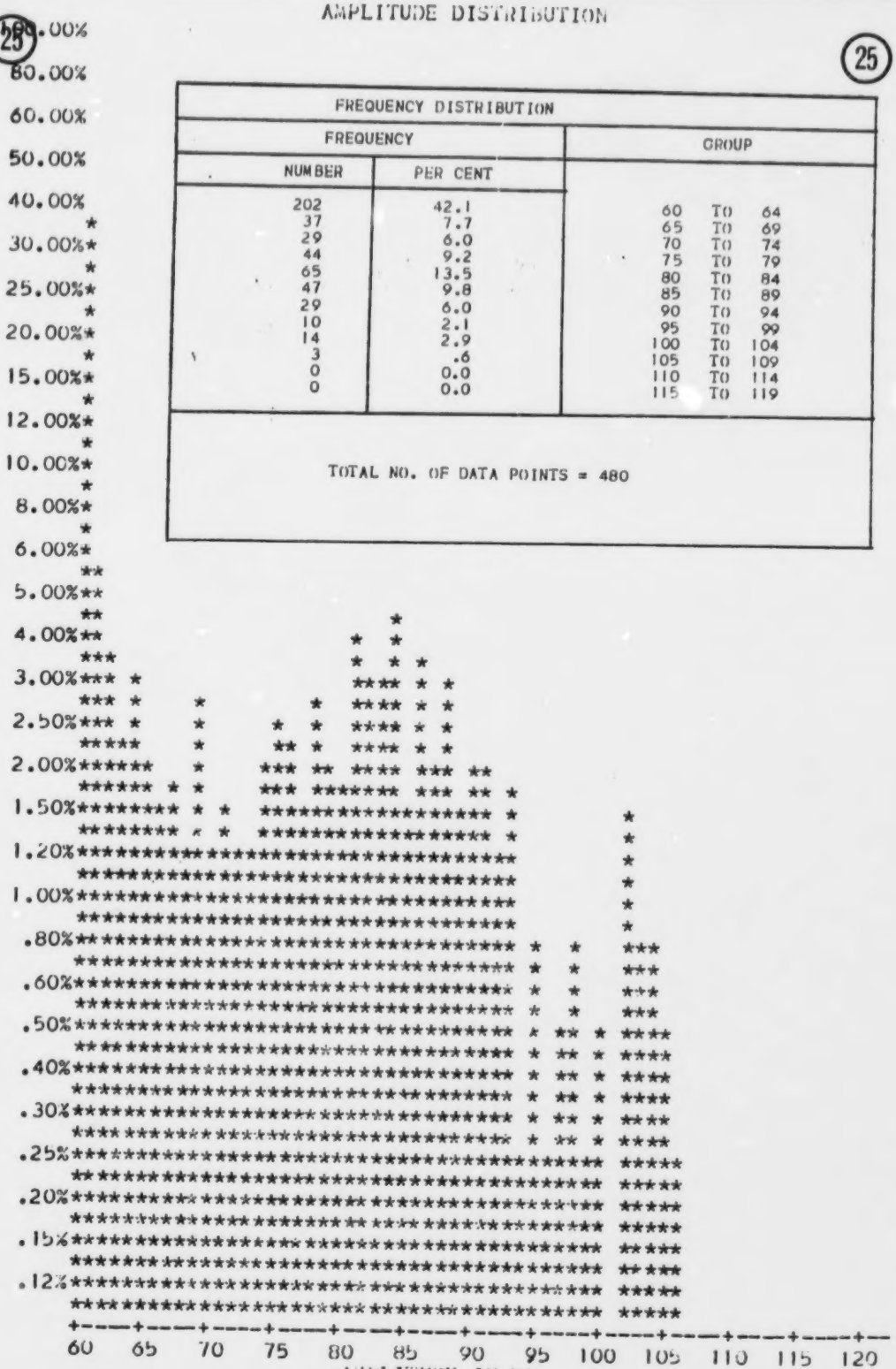
MIN. COMP. = 60 DB MAX. COMP. = 105 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 13 DB
VARIANCE =169 DB

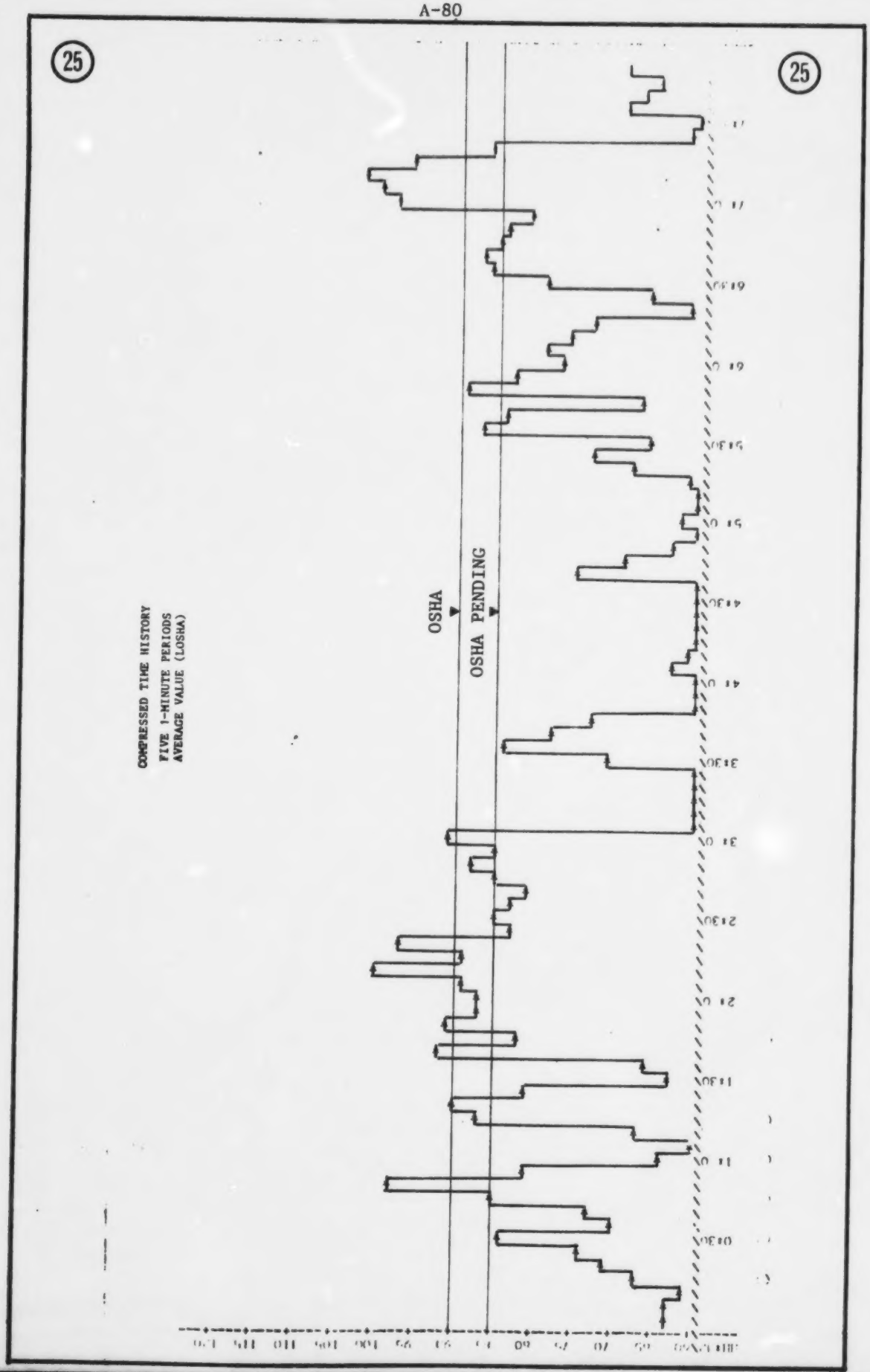
AMPLITUDE DISTRIBUTION

(23) (25)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
202	42.1	60 TO 64
37	7.7	65 TO 69
29	6.0	70 TO 74
44	9.2	75 TO 79
65	13.5	80 TO 84
47	9.8	85 TO 89
29	6.0	90 TO 94
10	2.1	95 TO 99
14	2.9	100 TO 104
3	.6	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




25
25
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(26)

(26)

```
67  80  81  80  80  82  86  85  81  71  89  87  86  77  87  89
64  66  70  87  72  75  75  81  73  77  89  91  71  86  93  91
89  89  90  92  95  99  92 100 101  71 101  97  91  92  92  92
91  92  90  89  83  85  87  86  91  85  85  87 101  93  92 101
```

```
ENTER LOG DATE (MO/DY/YR) : 10/07/79
ENTER SITE CODE (5 CHARS) : 20951
ENTER SEC CODE (4 CHARS) : 7364
ENTER JOB CODE (3 CHARS) : 283
```

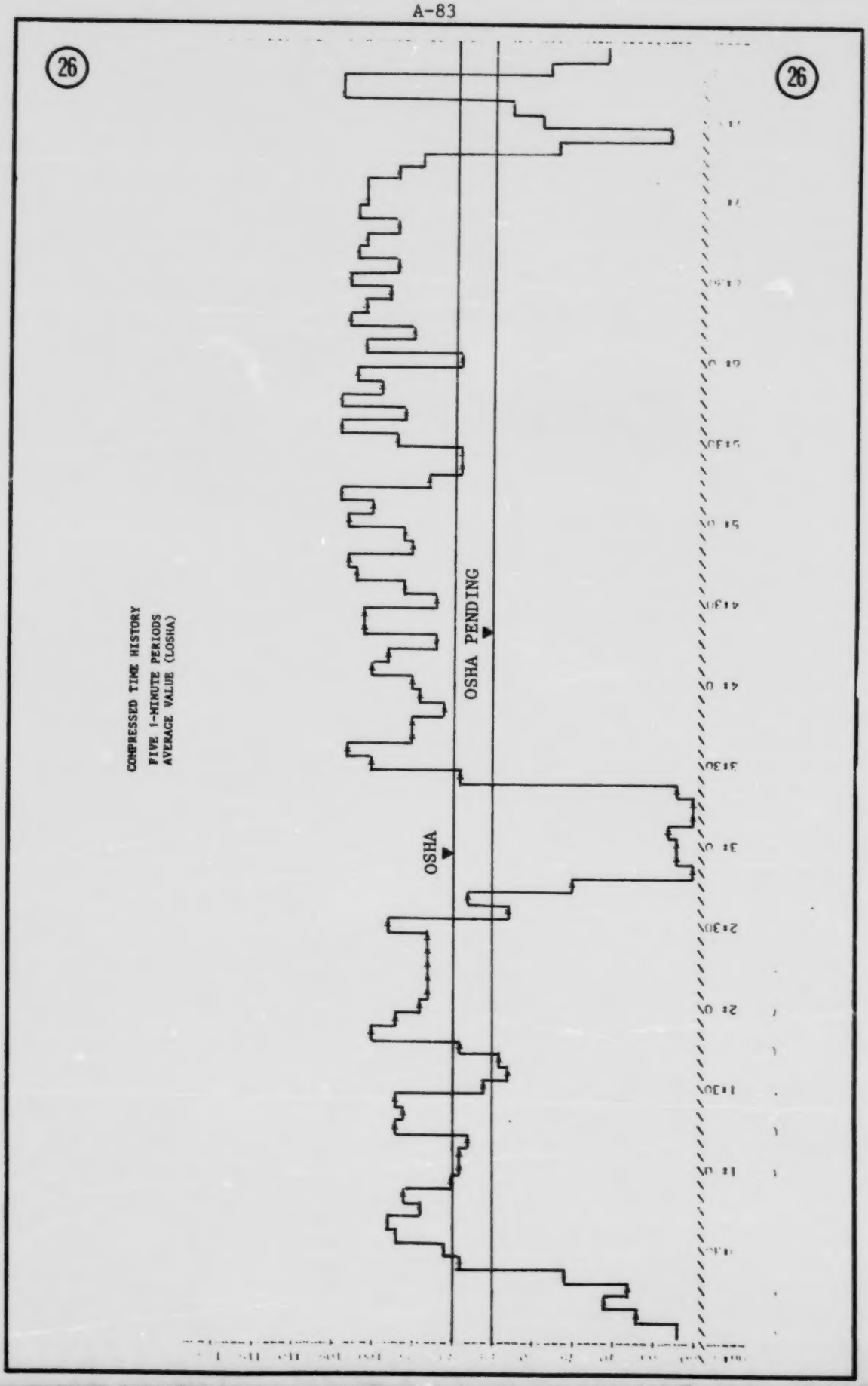
```
   DATA LOGGED :10 JULY 1979                DATA ANALYZED : 11 SEPT 1979
```

```
.01S  ...  ... ... (... ...) ...
...  ... ... ...
...  ... ... ...
...  ... ... ...
...  ... ... ...
  ...ER OF CO ...ATIONS = 4/5
...TION =  1 MINUTES
```

```
.I
...    ...    ...    ...    ...
   1    90.1    90.1    14.85    14.85
   2    83.4    82.2    28.15    34.00
   3    ...     1.      1.1      ...
   4    ...     ...     1.3      .15
   5    ...     ...     41.5     107.5
   6    92.4    ...     49.2     156.5
   7    ...     ...     ...      2.5
        ...     ...     8.1      ...
...  ... = 80 ...                ... = 1...
...  ...
...  ...
...  ...
```

(26) AMPLITUDE DISTRIBUTION (26)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
51	10.6	60 TO 64
22	4.6	65 TO 69
9	1.9	70 TO 74
17	3.5	75 TO 79
21	4.4	80 TO 84
81	16.9	85 TO 89
90	18.8	90 TO 94
58	12.1	95 TO 99
111	23.1	100 TO 104
20	4.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


26
26
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA PENDING
OSHA

(27)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A RETURN
  1  26  80  1220   60   64    4    1
  22248      119200  480
 61  60  73  71  60  72  60  76  72  61  80  76  80  73  75  75
 74  75  71  74  70  61  69  73  79  71  68  71  69  60  72  94
 91  90  90  90  94  92  91  93  91  91  93  92  93 100  95 101
 99  93  97 100 102 101  96  98  96  97  94 103 105  96  99  99
 90  89  91  90  92 105 105 104 102  98  95  98  76  94  96
 96  91  89  98 104  99 100 100  92  97  99 103 103 103 104 104
103 102 103  99  99 103 104 102 103 103  99  99  99 104  99  99
 99  96 101 101 100 103 106 106 106 104 104 104 104 102 102 102
 99  99  97  93  87  92  91  94  91  99 105 104 104 105 105 106
103 103 103 102 104 102 104  97  91 103 103  99  99 101 102 103
103 106 103 104 103 105 105 101  94  98 105 104 104 105 105 104
102 105 102 104 105 102  98 101 105 105 105 105 105 103 103 103
 99 103 105 105 101 102  97  97 101 105 105 105 104 106 105 102
105  97 104 105 105 102  99  97  91  92 106 102  97  91  87  91
 60  62  60  60  60  60  60  60  60  60  60  64  60  60  66  60
 61  60  60  64  75  60  60  60  63  60  60  60  60  60  60  60
 60  60  60  72  74  74  95  91 103 105 106 106 106 105 105 104
103 106 106 104 100  97  92  99 103 105 106 106 106 106 104 105
105 105 106 104 105 102 102 100  99 103 105 106 106 106 106 105
105 106 106 106 105 102  95  97 105 106 106 106 106 106 105 104
101  96 107 106 105 105  98  95 103 106 105 106 106 107 103 104
105 105 106 104 100  93  94 102 104 106 105 106 106 106 104 105
106 105 106 102  93  96 105 106 105 106 106 106 104 105 104 105
106 103  98  89  89  88  98 105 105 106 106 106 106 103 105 104
106 104  98  89  92 101 105 106 106 106 106 105 105 106 106 102
101  94 105  98  90  93 104  94  96  99  96  94  97 106 106 106
106 107 106 105 109 106  95  87  95 102  83  67  94  98 105  94
 60  90  98  98  95  88  88  86  88  89  90  92  86  99 100  99
100  96  96  94  83  74  65  65  64  62  65  66  77  78  79  79
%EOF
```

(27)

ENTER LOG DATE (MT/DY/YR) : 11/07/79

ENTER SITE CODE (5 CHARS) : 2RPAN

ENTER USER CODE (4 CHARS) : 2461
ENTER JOB CODE (3 CHARS) : 211

C

DATA LOGGED :11 JULY 1979
LOGGER : 08-301726
SPAN : 1220
[illegible] : [illegible]
[illegible] : [illegible]
SAMPLING RATE : 4/SEC
[illegible] =

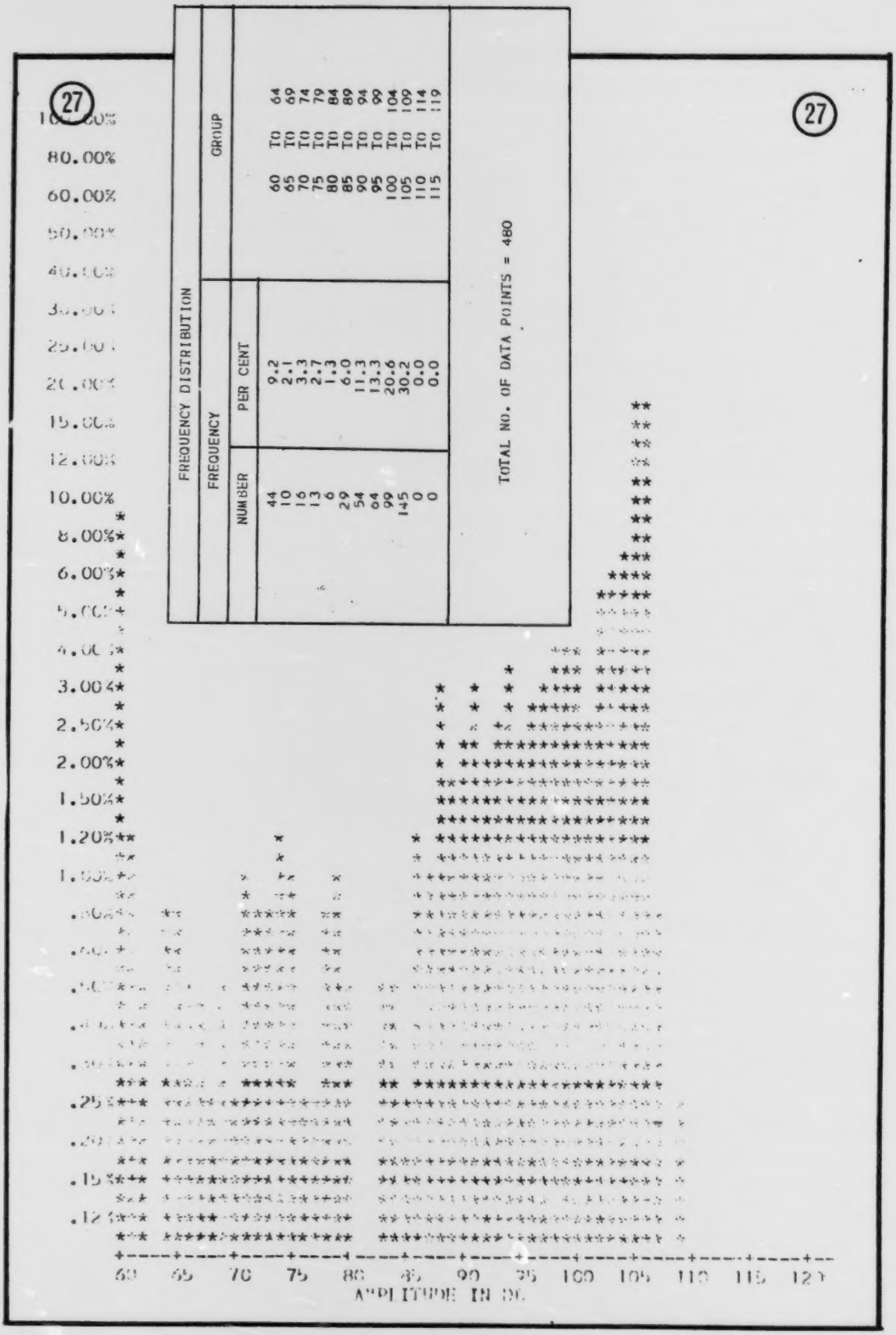
DATA ANALYZED : 12 SEPT 1979
SITE CODE : 2RPAN
JOB CODE : 211
[illegible] :
[illegible] :
TOTAL SAMPLES = 119200
STARTING [illegible] = 1

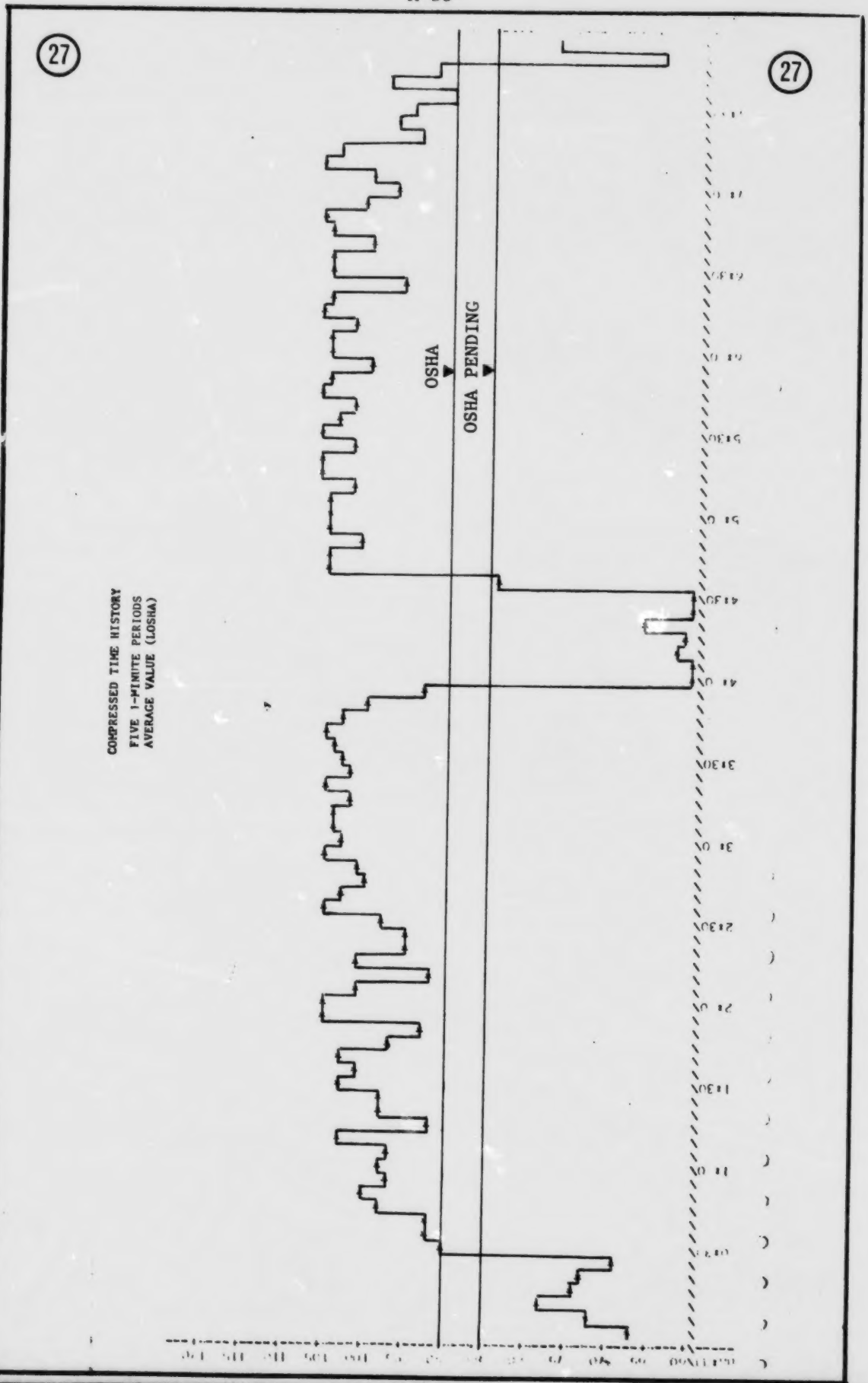
SITE HISTOGRAM ANALYSIS

[illegible] CALCULATIONS
[illegible]
[illegible]
[illegible]
[illegible]
NUMBER OF COMPUTATIONS = 481
PERIOD = 1 MINUTES

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	91.2	91.2	14.672	14.51
2	92.2	95.8	49.583	63.26
3	1[illegible]	[illegible]	[illegible]	[illegible]
4	104.1	[illegible]	13.224	154.1
5	9[illegible]	[illegible]	38.461	[illegible]
6	104.2	101.4	9[illegible]	31[illegible]
7	103.2	101.8	[illegible]	10[illegible]
8	[illegible]	10[illegible]	[illegible]	[illegible]

[illegible] = [illegible] [illegible] = [illegible]
ARITHMETIC MEAN = 94.05
[illegible] = 1[illegible]
[illegible]


(27)
(27)
FREQUENCY DISTRIBUTION
TOTAL NO. OF DATA POINTS = 480
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 44 9.2
65 TO 69 10 2.1
70 TO 74 16 3.3
75 TO 79 13 2.7
80 TO 84 6 1.3
85 TO 89 29 6.0
90 TO 94 54 11.3
95 TO 99 64 13.3
100 TO 104 99 20.6
105 TO 109 145 30.2
110 TO 114 0 0.0
115 TO 119 0 0.0
80.00%
60.00%
10.00%
8.00%
6.00%
3.00%
2.50%
2.00%
1.50%
1.20%
.25%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


27
27
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(28)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

```
  1  26  40  1217   60    64     4     1
   1b921     115200   460
  73  70  66  66  72  64  66  64  69  60  60  61  60  60  60  63
  69  64  62  60  89  92  90  91  92  94  91  91  91  90  91  91
  93  93  99  97 102 100  97  96 101 102 104 100  88  85  85  87
  94  97  88  92  97  98  96  97  90  92  85  83  95  82  71  82
  95  89  97  96  90 100  85  86  85  91  98 102 101  98  97  97
  97  97  97  97  97  97  97  97  97  97  97  97  97  97  97  97
 100  95  96  96  96  97  95  95  95  95  92 101 102 103 101 103
 104 100  92  95  95  95  98 101 103 101 101 104 103 102  99  97
  95  97 100 102 104 102 102 104 102  99  95  95  96 100 102 104
 104 102 104 102 103  97  93  92  93  95  95 102 105 105 102 104
 101  97  95  95  97 101 102 104 101 102 104 102  99  97  95  98
  94  98 101 103 104 101 103 103 101  98  96  95  95  99 101 103
 103 101 104 102 100  92  97  97  97  97  95  96 102 103 103 101
 104 101  97  96  94  94  95 100 102 103 103 102  90  87  93  96
  86  89  85  85  87  85  85  85  85  85  93  88  85  88  98  89
  89  89  92  89  90  89  89  85  93  92  92  95  89  89  89  92
  89  89  89  89  89  89  89  89  91  95  89 100 103  91  86  85
  85  94  94  93  95  98  94  94  93  96  94  93  94  99 104 104
 104 104 105 104 103 104 104 104 104 104 106 106 105 105 103 102
 102 102  92  95  97  98 101 102 103 104 102 104 101  97  96  97
  98  96  96 100 102 103 102 101 103 103 100  96  93  94  97  96
  99 103 103 104 103 101 103  80  85 104 102 101  97  93  94  96
 101 103 103 105 102 104 105 102 100  93  93  94  94  99 103 104
 104 105 102 105 103 101  98  93  93  99 102 104 104 104 103 105
 102 101  96  93  95 101 103 103 103 103 104 103 101  99  93  93
  97 101 104 104 103 102 104 104 102 100  94  94  98 102 103 104
 103 102 105 103 101  95  93  94  98  96 102 104 105 105 102 103
 104 104 104 103  82  84  85  76  66  65  60  61  61  77  77  71
  73  82  80  72  73  66  67  64  66  72  74  80  78  75  82  93
  96  91  94  94  96  94  95  94  97  83  68  60  65  64  65  61
4EOF
```

(28)

```
ENTER LOG DATE (DD/MM/YR) : 11/07/79
ENTER SITE CODE (5 CHARS) : 30289
ENTER USER CODE (4 CHARS) : 7394
 ENTER JOB CODE (3 CHARS) : 283
```

```
   DATA LOGGED :11 JULY 1979          DATA ANALYZED : 12 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : 30289
SERIAL NUMBER : 1217                      JOB CODE : 283
      BASELINE : 60 DB                   USER CODE : 7394
DYNAMIC RANGE : 64 DB                    TRIGGER :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES = 115200
TEST DURATION =   8: 0: 0             STANDBY TIME =  1:18:20
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 460
PERIOD = 1 MINUTES

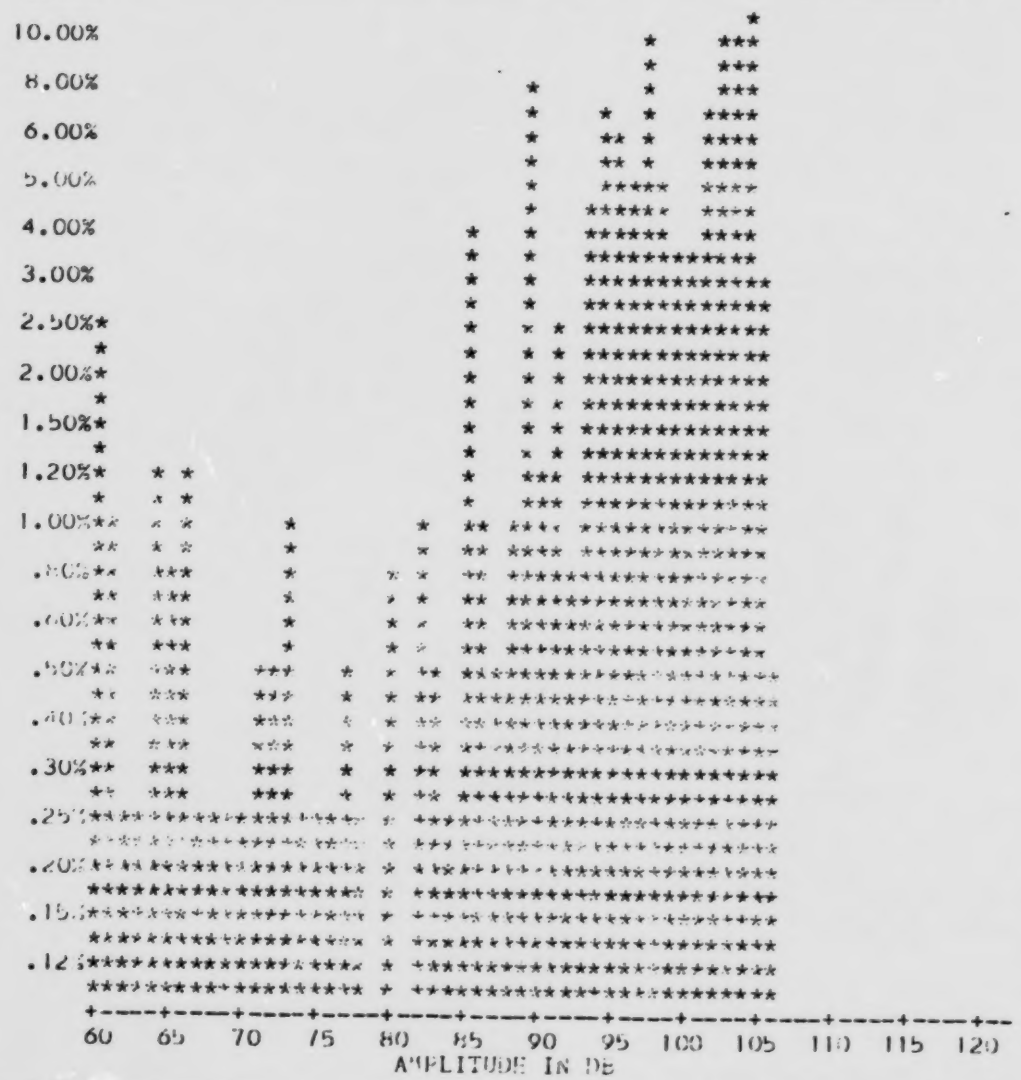
TIME HOUR	LOG A CURRENT	LOG A CUMULATIVE	DOSE CURRENT	DOSE CUMULATIVE
1	92.6	92.6	17.811	17.81
2	97.2	95.2	33.933	51.74
3	100.1	97.5	54.893	106.64
4	98.3	97.7	38.022	144.66
5	97.4	97.6	44.224	190.88
6	101.1	98.3	42.921	233.80
7	101.4	98.9	60.480	294.28
8	94.0	98.4	21.934	320.22

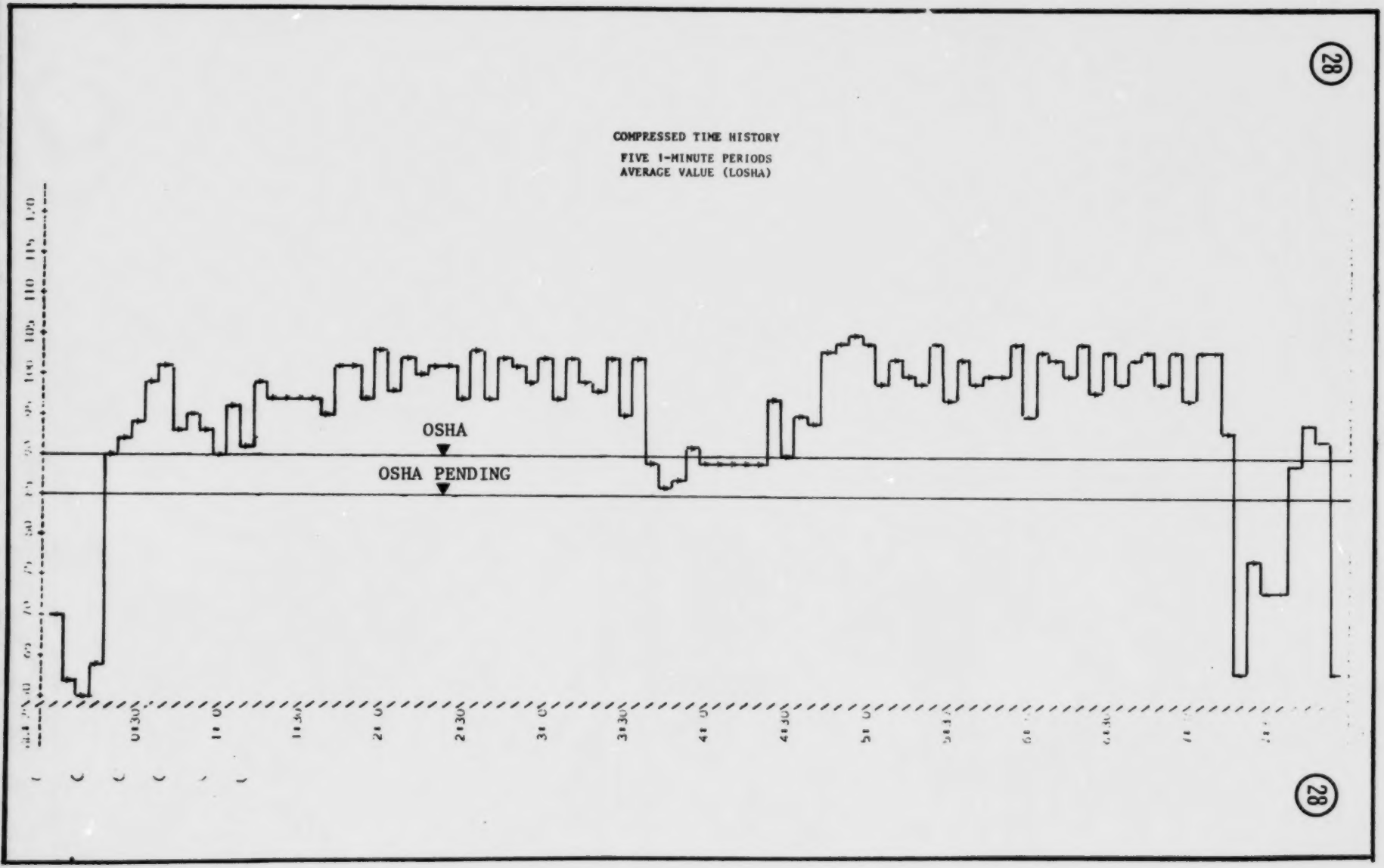
MIN. CONC. = 80 DB MAX. CONC. = 105 DB
ARITHMETIC MEAN = 94 DB
STD. DEVIATION = 11 DB
VARIANCE =121 DB

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
21	4.4	60 TO 64
11	2.3	65 TO 69
10	2.1	70 TO 74
5	1.0	75 TO 79
10	2.1	80 TO 84
56	11.7	85 TO 89
64	13.3	90 TO 94
119	24.8	95 TO 99
169	35.2	100 TO 104
15	3.1	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

(128) (28)




28
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
28

29

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1214     60     64     4     1
     234      115200   480
 61  60  60  60  63  60  62  60  61  66  68  66  60  66  66  63
 66  60  60  60  61  60  61  68  65  65  70  71  63  65  65  71
 71  62  69  74  67  69  60  62  63  61  66  60  63  70  73  62
 63  63  60  60  63  60  65  71  81  77  84  74  63  74  63  61
 66  61  61  61  62  60  60  60  60  62  63  61  75  61  62  83
 72  70  72  63  68  67  81  67  68  66  66  87  72  81  78  79
 93  94  89  91  96  85  84  83  90 102 103 100  86  95  86  89
 62  72  60  60  62  72  82  68  70  68  68  62  82  70  61  63
 60  90  89  63  61  60  61  64  60  62  84  99  91  81  88  81
 81  72  60  72  60  60  75  73  84  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  92  60  60  60  66  85
 93  94  89 102  98 103  97 100 100  94  99  95  96 102  97  95
 97 102  99  91  92  93 105 100 105  88 102 111 101 112 110 110
113 105  67  60  82  60  70  69  68  69  65  87 110 112 113 114
112 112 110 103 110 109 111 107 108 105 106 112 111 112 112 114
114 110  60  74  70  83  85 110 112 112 114 105  99  83  73  76
 74  68  64  68  67  79  73  60  60  60  60  60  60  60  70  72
 61  61  60  68  60  60  60  60  73  64  60  60  60  60  62  66
 60  60  60  60  62  60  63  65  60  60  60  61  68  70  64  73
 60  60  60  66  66  61  60  61  60  60  60  60  60  60  60  60
 60  60  60  60  71  76  64  74  85  78  65  91  87  93  95  91
 92  91  92  95  97  87  95  96  95  99  97  97  97  96  85  72
 65  69  83  80  81  82  85  86  85  94  90  85  80  71  91  94
 99  96  93  90 103 104  98 100 100  96  99  93  92  82  93  82
 86  75  76  77  73  72  72  92  81  76  87  83  73  75  73  82
 83  80  79  81  83  66  65  64  67  74  71  84  82  83  80  75
 80  83  82  79  77  82  87  80  76  73  71  73  73  66  70  66
 77  72  72  79  88  82  81  72  77  74  78  76  78  82  81  74
 76  66  72  84  84  78  77  69  64  72  68  73  71  72  62  66
 62  63  65  64  65  60  61  62  66  71  66  66  60  63  65  60
%EOF
```

29

```
ENTER LOG DATE (DD/MM/YR) : 22/08/79
ENTER SITE CODE (5 CHARS) : 00307
ENTER USER CODE (4 CHARS) : 4139

 ENTER JOB CODE (3 CHARS) : 214
```

```
    DATA LOGGED :22  AUG 1979
         LOGGER : DB-301/26
SERIAL NUMBER : 1214
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =    8: 0: 0

DATA ANALYZED : 25 SEPT 1979
    SITE CODE : 00307
     JOB CODE : 214
    USER CODE : 4139
   TAPE SPOOL : [illegible]
TOTAL SAMPLES =  115200
STARTAY TIME =    0: 0:0
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		[illegible]	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	68.0	68.0	.588	.59
2	86.3	81.8	7.469	8.05
3	82.7	82.1	4.534	12.59
4	105.8	91.6	111.407	123.98
5	96.3	95.5	30.116	154.11
6	87.1	95.6	8.376	162.49
7	89.9	96.0	12.359	174.85
8	75.5	94.1	1.642	176.50

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 76 DB
STD. DEVIATION = 16 DB
VARIANCE = 290 DB

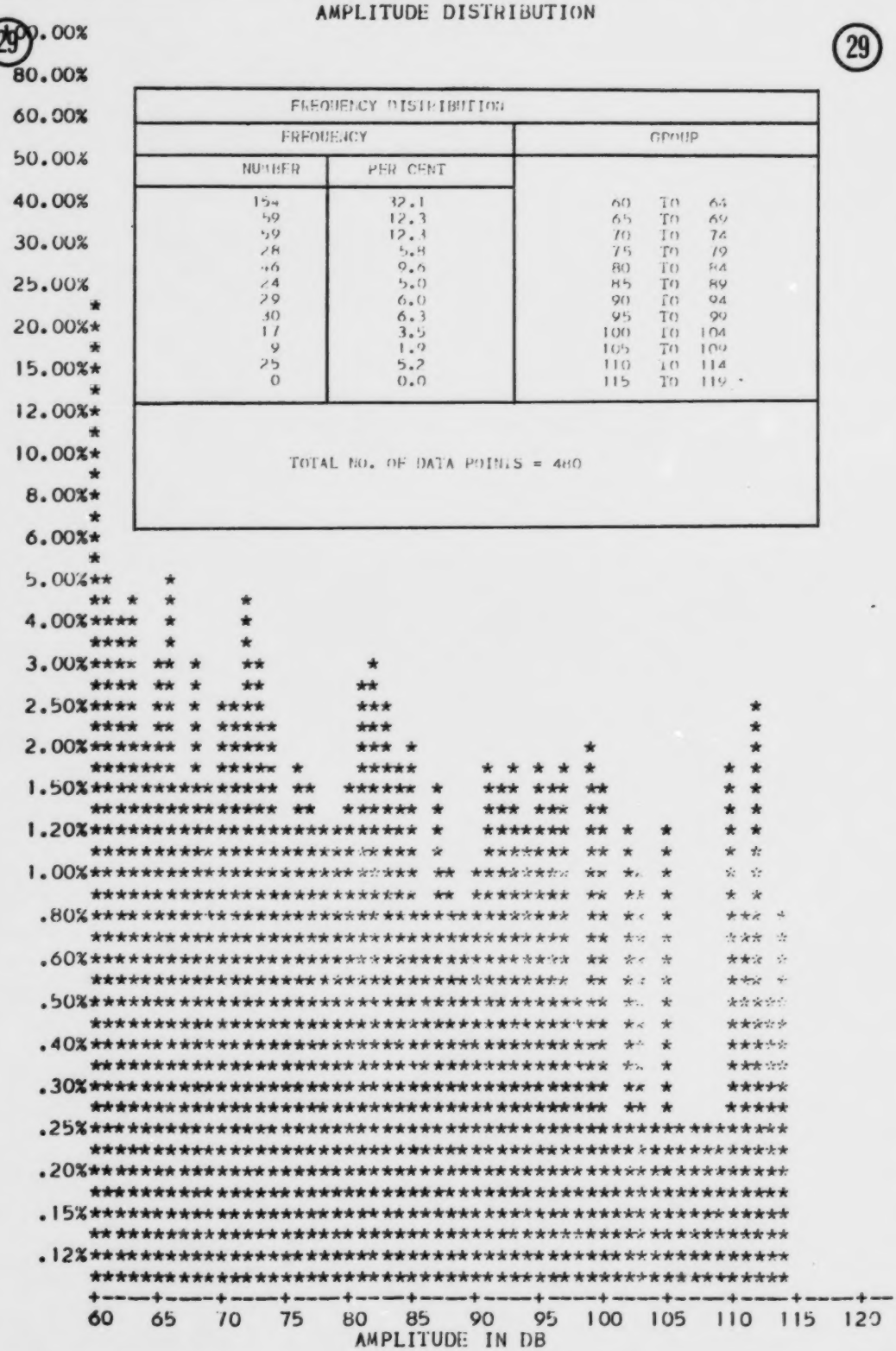
MAX. COMP. = 114 DB

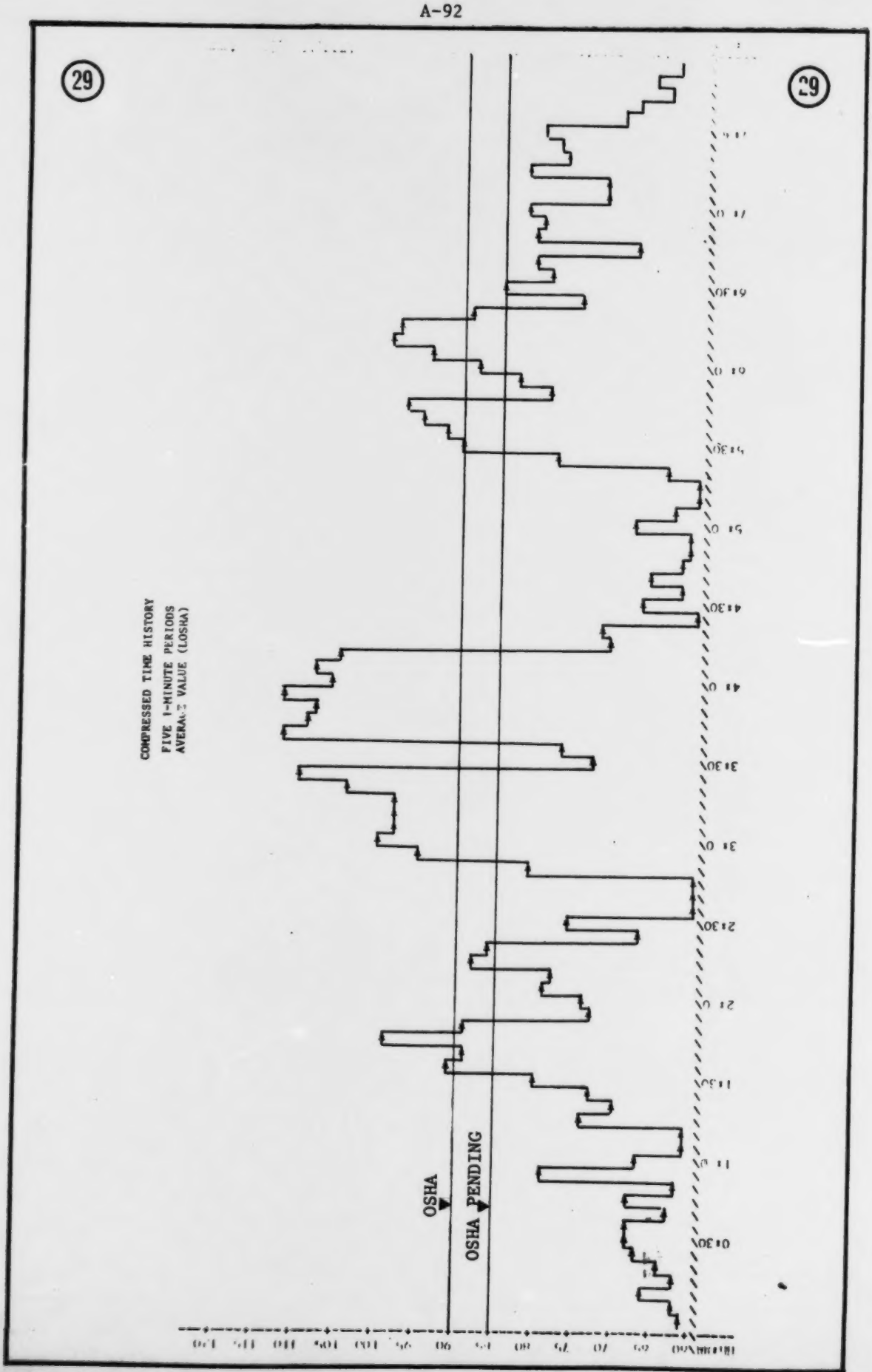
AMPLITUDE DISTRIBUTION

(29) (29)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
154	32.1	60 TO 64
59	12.3	65 TO 69
59	12.3	70 TO 74
28	5.8	75 TO 79
46	9.6	80 TO 84
24	5.0	85 TO 89
29	6.0	90 TO 94
30	6.3	95 TO 99
17	3.5	100 TO 104
9	1.9	105 TO 109
25	5.2	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




29
29
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:30
2:30
3:30
4:30
5:30
6:30

(30)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1220   60   64    4    1
     117    115200  480
 60  60  62  60  60  60  60  60  60  60  60  60  60  61  65  77
 62  71  75  80  69  83  89  89  89  89  89  90  89  89  89  90
 90  89  89  89  89  89  89  90  89  89  89  89  90  89  89  89
 89  91  89  89  90  90  89  90  88  97 100  98  99  99  99  98
100 100  98  77  67  60  60  60  60  60  60  61  66  60  60  60
 60  60  60  60  60  60  63  62  64  60  61  60  60  60  60  60
 60  60  65  60  60  66  60  60  60  60  63  71  60  60  60  60
 60  60  64  72  89  60  60  60  62  64  60  65  60  60 106 109
 63  60  60  60 103 112 112 111 103 104 111 105  60  61  60  64
 60  60  60  60  60  65  72  62  60  60  66  70  92 102 100  72
 60  60  60  60  60  60  60  92  91  90  88  66  60  60  60  60
 60  60  65  61  67  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  61  60  60  60  60
 60  60  60  60  60  72  72  76  60  60  60  67  65  62  82  80
 61  61  60  62  62  61  60  66  67  68  73  73  88  85  82  64
 62  70  70  66  69  73  63  63  70  65  60  63  63  66  63  63
 60  63  71  73  72  62  77  88  94  93  92  73  60  60  63  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 63  60  60  60  60  60  60  60  60  60  60  60  60  60  63  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  61  64  61  60  60  60  60  60  60 105  60
 61  60  62  60  64  70  77  71  64  73  79  86  82  90  84  83
 83  97  96  66 102 104 106 101  72  72  67  80  78  80  72  67
 70  72  74  68  72  64  64  60  68  70  60  60  60  63  63  68
 64  64  77  67  64  66  65  60  63  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  72  60
 63  61  60  60  61  60  60  60  60  60  65  60  60  60  61  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  62  60  60  60  60  60  66  72  60  60  60  60
%EOF
```

(30)

```
ENTER LOG DATE (DD/MM/YR) : 23/07/79
ENTER SITE CODE (5 CHARS) : CC230
ENTER USER CODE (4 CHARS) : 4122

 ENTER JOB CODE (3 CHARS) : 213
```

```
     DATA LOGGED :23 JULY 1979
          LOGGER : DB-301/26
   SERIAL NUMBER : 1220
        BASELINE : 60 DB
  DYNAMIC RANGE : 64 DB
  SAMPLING RATE :  4/SEC
  TEST DURATION =   8: 0: 0

DATA ANALYZED : 17 SEPT 1979
    SITE CODE : CC230
     JOB CODE : 213
    USER CODE : 4122
    THRESHOLD :  80 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =   0: 0:29
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
 100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGEA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	87.5	87.5	8.888	8.89
2	84.1	85.0	5.545	14.43
3	90.4	91.3	30.208	44.64
4	69.8	89.3	.756	45.40
5	74.5	87.9	1.466	46.86
6	87.7	87.9	9.127	55.99
7	67.4	86.8	.545	56.54
8	60.6	85.9	.219	56.75

```
MIN. COMP. =  60 DB          MAX. COMP. = 112 DB
ARITHMETIC MEAN =  87 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```

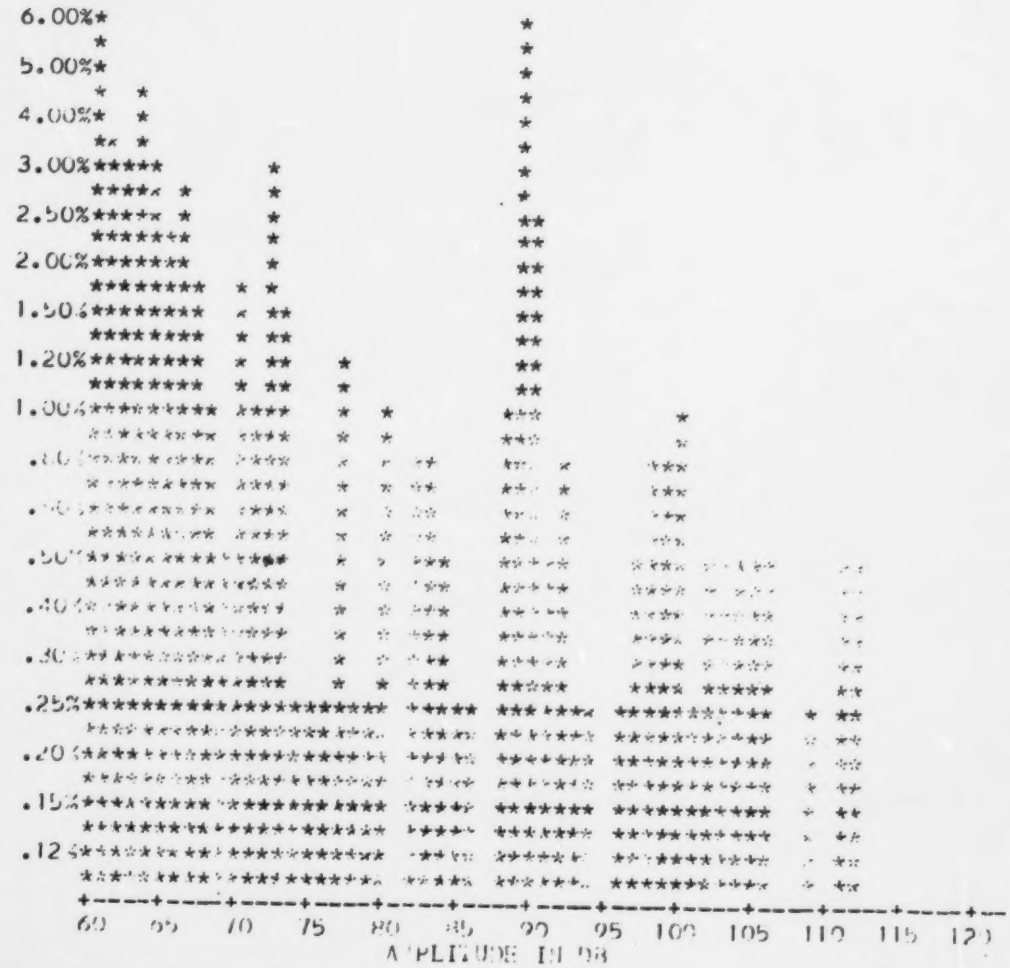
AMPLITUDE DISTRIBUTION

(30)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
317	66.0	60 TO 64
33	6.9	65 TO 69
31	6.5	70 TO 74
9	1.9	75 TO 79
12	2.5	80 TO 84
32	6.7	85 TO 89
17	3.5	90 TO 94
9	1.9	95 TO 99
11	2.3	100 TO 104
5	1.0	105 TO 109
4	.8	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

(30)



30
30
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:30
2:30
3:30
4:30

(31)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1226 60 64 4 1
113 115200 480

60	60	68	60	60	64	75	61	61	62	76	76	65	64	66	63
66	60	61	91	80	63	81	79	67	67	60	75	83	81	72	80
92	93	83	67	69	76	70	89	89	93	94	90	89	96	94	96
96	96	97	100	97	96	97	96	97	95	96	96	98	97	92	94
93	95	94	92	92	93	95	89	90	93	95	94	94	93	94	94
95	98	94	94	94	94	94	94	93	93	92	71	61	60	64	81
93	93	93	93	94	91	96	87	93	94	96	96	93	94	93	94
95	95	95	96	95	98	97	96	95	95	96	92	79	97	95	95
95	98	101	101	102	93	94	98	100	100	97	91	70	74	61	60
60	60	60	60	60	62	60	60	60	61	64	60	60	60	60	60
60	60	60	60	62	60	80	85	85	84	84	84	84	85	84	86
85	86	95	100	96	95	87	97	98	95	100	101	99	99	99	99
102	102	101	98	98	94	97	97	97	90	94	89	92	93	95	96
96	94	94	78	73	71	79	84	73	60	79	80	95	98	99	98
89	76	82	85	85	86	86	86	86	86	86	86	87	86	95	92
97	97	101	101	103	104	104	101	62	60	62	72	93	106	106	108
100	96	60	60	60	60	60	60	60	72	60	60	60	60	60	60
60	60	60	92	107	108	108	108	107	108	108	106	103	98	96	96
96	97	95	98	96	101	105	108	109	108	109	104	95	95	96	95
97	105	107	107	107	105	106	107	83	78	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	76	67	66	60	71	79	78	90	96	97
101	98	92	92	89	89	89	89	85	76	66	74	64	64	78	90
90	90	92	90	90	92	91	90	89	90	94	90	91	90	90	92
90	92	90	90	90	93	90	90	92	90	90	90	90	90	97	98
92	96	91	92	90	99	93	96	100	99	88	88	88	89	89	89
96	99	100	90	88	89	88	90	88	89	89	90	96	89	91	92
89	89	92	93	89	93	90	89	94	99	99	100	96	96	84	86
80	72	60	67	65	67	82	76	69	79	84	83	83	83	83	83
84	85	85	85	84	85	82	83	83	82	81	79	80	81	82	76

%EOF

(31)

ENTER LOG DATE (DD/MM/YR) : 31/07/79
ENTER SITE CODE (5 CHARS) : SHAFI

ENTER USER CODE (4 CHARS) : 4561
ENTER JOB CODE (3 CHARS) : 214

DATA LOGGED :31 JULY 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1226
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 20 SEPT 1979
SITE CODE : SHAFI
JOB CODE : 214
USER CODE : 4561
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:28

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	88.8	88.8	10.617	10.62
2	93.6	91.6	20.645	31.26
3	90.5	91.3	13.374	44.64
4	94.2	92.1	22.246	66.88
5	100.8	94.9	55.774	122.66
6	93.7	94.7	20.782	143.44
7	91.9	94.3	16.303	159.74
8	88.5	93.8	10.209	169.95

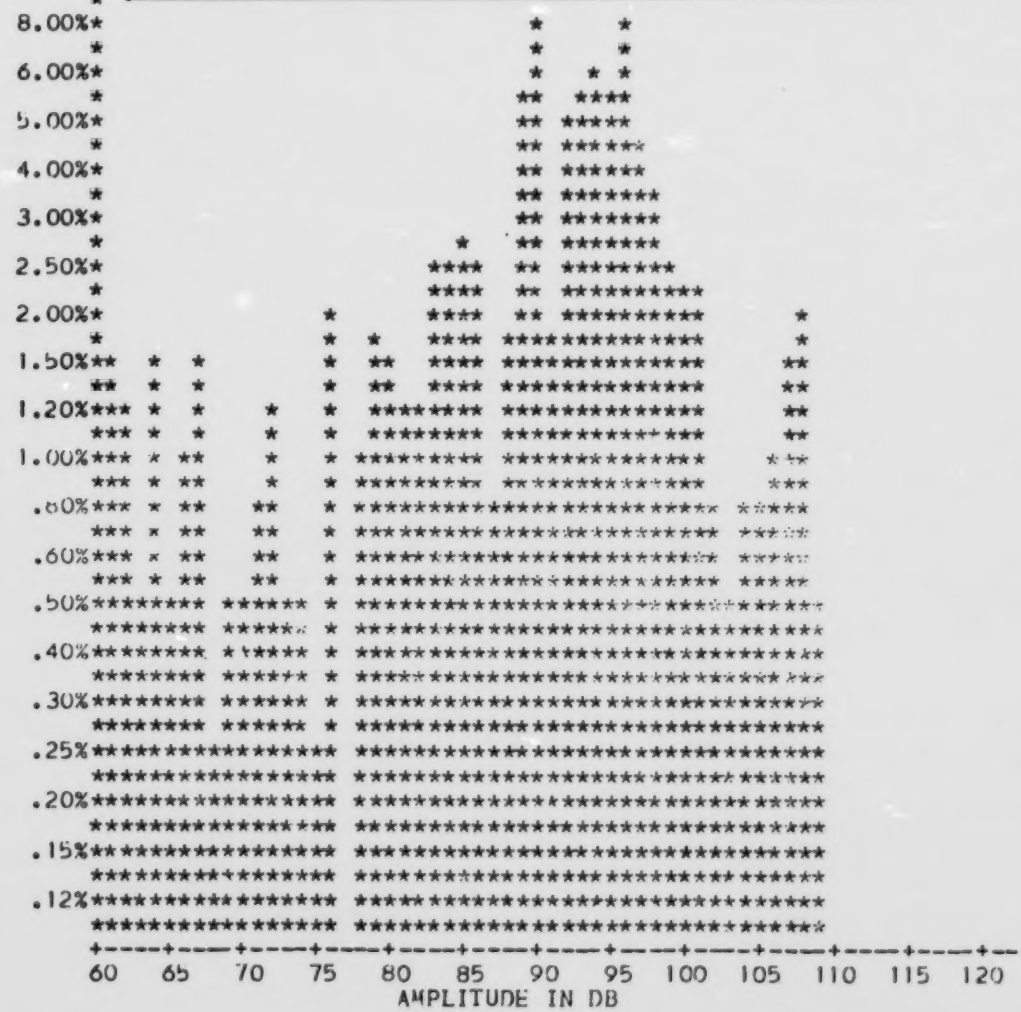
MIN. COMP. = 60 DB
MAX. COMP. = 109 DB
ARITHMETIC MEAN = 84 DB
STD. DEVIATION = 15 DB
VARIANCE =225 DB

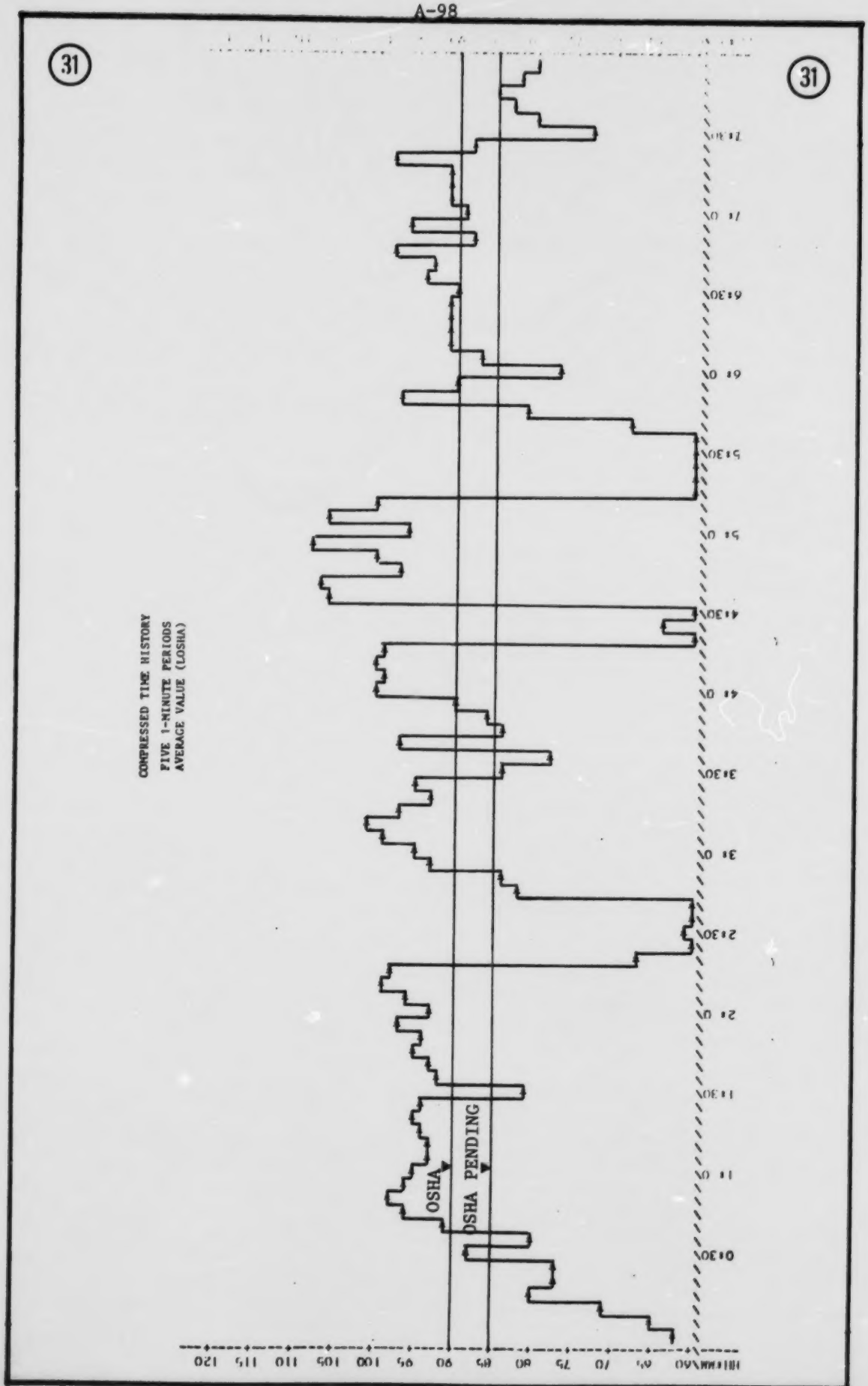
AMPLITUDE DISTRIBUTION

(31) (31)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
93	19.4	60 TO 64
15	3.1	65 TO 69
14	2.9	70 TO 74
20	4.2	75 TO 79
36	7.5	80 TO 84
53	11.0	85 TO 89
104	21.7	90 TO 94
96	20.0	95 TO 99
26	5.4	100 TO 104
23	4.8	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




31
31
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
HH:MM:SS
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
60
65
70
75
80
85
90
95
100
105
110
115
120

(32)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1   26   80   1225     60     64      4      1
      108       115200   480
  68   61   62   62   68   60   62   60   60   62   61   61   74   60   60   62
  62   60   60   60   60   60   60   62   63   64   64   63   60   60   63   60
  60   68   69   66   72   60   61   61   60   64   67   77   82   85   84   96
  79   80   93   67   60   60   60   77   93   90   90   91   90   90   91   91
  90   93   98  100   98   95   98   98   98   99   99   97   95   90   76   72
  60   60   60   60   60   60   82   86   60   61   64   60   65   94   70   61
  60   84   89   85   92   95   95   94   93   91   97   90   94   93   99   97
  98   91   83   87   87   92   95   94   94   90   91   91   94   93   93   94
  92   96   94   96   96   98   99  100   97   96   98  100  100   97   98   96
  93   98  103  104  104  103  102  103  101   97  102   98   22   97  103  104
 104  103  102  103  103   99   98   92   93  103  104  104  103  101  103  101
  94   95   96   92   96   97   92   96   94   95  104  100  101  102  101  100
  94   96  101  104  104  104  104  102  101  103  103  102   97   94  100  103
 104  104  104  103   98  103  103  103   98   91   96   95   96  101  103  105
 104  104  102  101  103  101  103   99   97   95   99  103  104  103  104  103
 100  103  103  102   93   94   96   95  101  104  104  103  104  103  102  103
 103  101   91   96   94   96  103  104  105  103  104  103  101  103  103  100
  92   98   94   95  102  104  104  103  103  103  100  104  100   98   95   83
  66   75   69   68   62   60   62   72   60   76   60   67   60   60   61   60
  60   60   60   60   63   60   64   75   60   60   60   60   73   68   61   72
  69   65   60   67   60   65   95   89   96  103  100   96  100   95   97  103
 104  103  103  103  101   99  103  103  101   99   96   95  103  104  104  104
 103   98  100   87   88   98  102  102  102   98   92   93   97  103  104  104
 104  102  102  102  103  103   97   92   97   96   94   92   95   94   96  100
 103  104  103  103   99  100  102  103  101   92   92  101  104  104  103  103
 100  101  102  102   95   96   90   98  104  104  103  103  102  100  103  103
  95   88   88   89   96   91   91   99  104  104  103  102  102  100  100  103
 103  103  101   91   98  103  102  104  103  102  103  102  103  102   95   90
  99  104  104  103  103  102  100   99  103  102   94   93  103  104  103  103
 103  101  103   99   89   60   62   66   60   60   61   63   60   60   60   60
%EOF
```

(32)

```
ENTER LOG DATE (DD/MM/YR) : 16/07/79

ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 7355

 ENTER JOB CODE (3 CHARS) : 211
```

```
   DATA LOGGED :16 JULY 1979          DATA ANALYZED : 13 SEPT 1979
        LOGGER : 08-301/26                SITE CODE : CC210
SERIAL NUMBER : 1225                       JOB CODE : 211
      BASELINE : 60 DB                    USER CODE : 7355
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                  TOTAL SAMPLES =  115200
TEST DURATION =   8H 0M 0               STANDBY TIME =   0H 0M 7
```

TIME HISTORY ANALYSIS

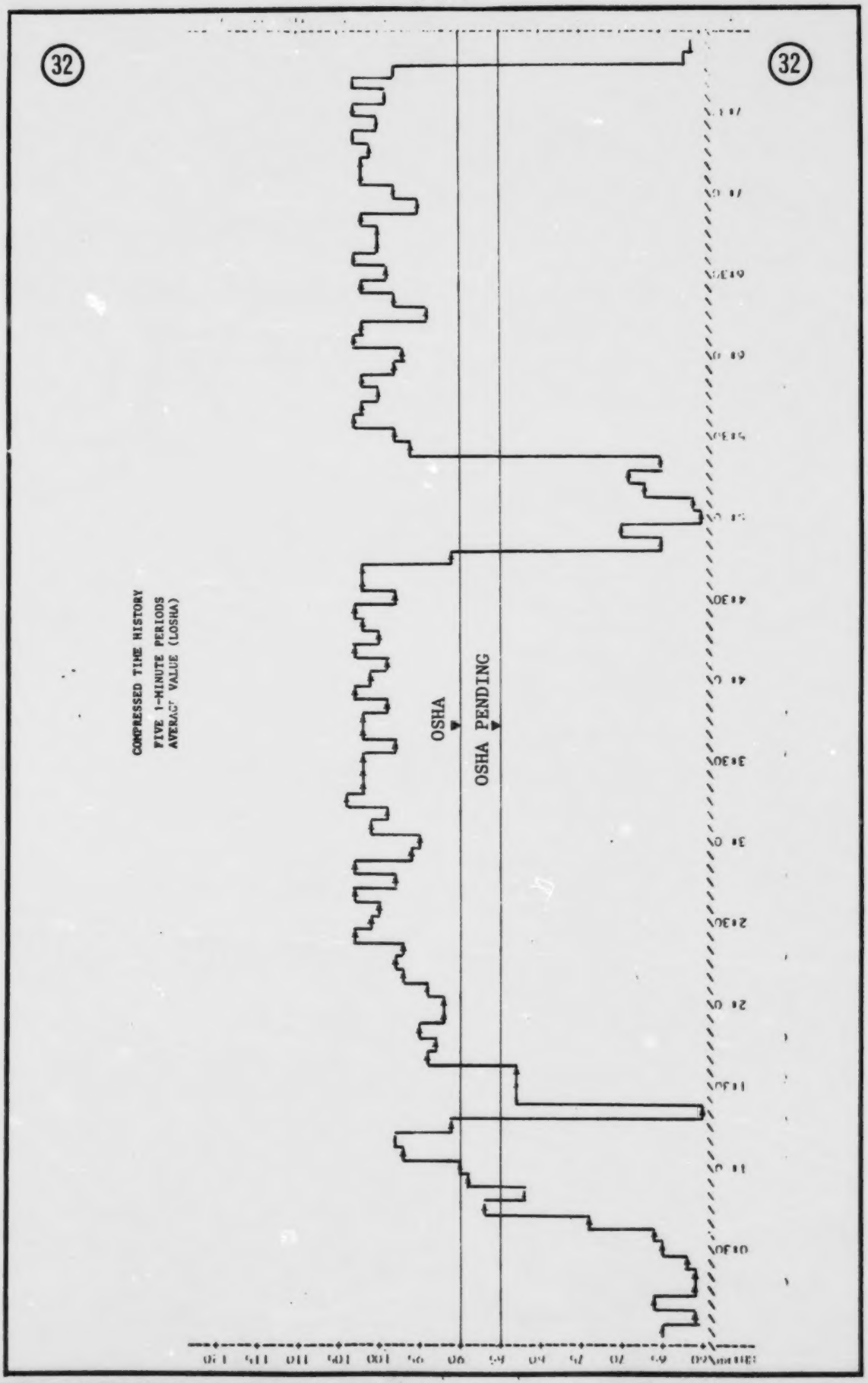
```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOUDNESS		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	77.6	77.6	2.242	2.24
2	92.1	84.0	16.713	18.96
3	97.3	93.9	49.596	68.55
4	101.2	96.5	58.706	123.26
5	99.5	97.2	46.536	169.80
6	96.4	97.1	30.381	200.18
7	100.3	97.6	52.474	252.65
8	99.8	97.9	48.384	301.03

```
MIN. COMP. =  60 DB                MAX. COMP. = 100 DB
ARITHMETIC MEAN =  96 DB
STD. DEVIATION =  15 DB
VARIANCE =256 DB
```

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
82	17.1	60 TO 64
19	4.0	65 TO 69
7	1.5	70 TO 74
7	1.5	75 TO 79
7	1.5	80 TO 84
13	2.7	85 TO 89
65	13.5	90 TO 94
90	18.8	95 TO 99
188	39.2	100 TO 104
2	.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

(32) (32)


32
32
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(33)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226    60    64    4    1
     180     115200  480
 77  71  60  61  63  72  74  64  79  91  91  93  94  93  93  96
101  98  98  95  96  98  93  97  93  70  68  60  60  60  60  60
 60  60  60  60  65  60  61  71  68  72  91  86  85  85 100  96
 97  95  90  90  90  90  90  90  91  89  90  89  80  89  89  91
 89  82  80  91  89  82  89  90  88  89  92  89  89  89  89  90
 91 104 100  94 102 100 100  61  72  94  95 105 104 104 101  94
 94 103  96 102  97  96  93  96  95 102 106 106 105 106 102 102
102 101 106 106  95  94  97  98 103 105 106 104 105 104 103 101
106 106 104  95  96  95  97 104 106 105 106 102  89 106 106 103
 95  95  96  97 102 106 106 105 104 104 103 105 106 102  91  94
 94  96  95  95 102 106 105 106 104 104 105 106 101 101  96  98
102 105 106 105 105 103 101 105 105 105  98  94  87  95  97 106
106 105 106 104 101 104 103 104 102  98  95  97  94  96 103 106
105 105 105 103 105 106 106  98  93  93  93  96 102 105 106 105 105
105 103 105 105 106 100  93  93  97  93  95 102 105 106 105 105
103 105 105  96  70  60  65  60  60  60  63  72  62  60  60  60
 61  63  60  60  60  64  60  60  50  61  60  62  64  60  60  62
 60  60  60  65  60  60  60  60  60  60  66  60  68  91 102 105
105 104  97 100 100 106 105 102 101 103 104 104 101  97 102
106 105 105 103 105 105 101 105 103  97 104 106 105 106 101  96
 92  99 103 101 103 103  99 105 101  94 101 106 105 106 104 102
105 104 104 106  99  93 101 107 105 104 105 102  99 102 105 103
105 104  96  99 106 105 103 105 105 100  96  92 104 104 106 102
 91  97 101 106 105 105 103 102 105 103 105 101 104 104  97  99
 99 101 104 102 105 103  91  97 105 105 104 105 103 103 105 104
104  98  89 101 106 104 105 104 101 102 105 104 105 100 101  99
105 103 102 105 103  99 104 104  89  84  67  70  69  72  71  72
 71  68  65  73  64  65  65  87  87  86  86  86  90  98 100  89
 87 100  95  93  94  91  88  85  97 100 100  93  88  86  83  82
ALOF
```

(33)

```
ENTER LOG DATE (DD/MM/YR) : 17/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 7355
 ENTER JOB CODE (3 CHARS) : 211
```

```
    DATA LOGGED :17 JULY 1979
         LOGGER : [illegible]
SERIAL NUMBER : 1226
   BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4750 C
TEST DURATION =  [illegible]
```

```
DATA ANALYZED : 14 SEPT 1979
SITE CODE : CC210
JOB CODE : 211
USER CODE : 7355
[illegible]
TOTAL SAMPLES = 115200
START TIME = [illegible]
```

TIME HISTORY ANALYSIS

```
[illegible] CALCULATIONS
AND BASED ON [illegible]
[illegible] = 480 / [illegible]
[illegible] = [illegible]
THRESHOLD (CUTOFF) LEVEL = 50 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 [illegible]
```

[illegible]	Level		[illegible]	
[illegible]	[illegible]	CUMULATIVE	[illegible]	CUMULATIVE
1	84.9	84.9	12.381	12.38
2	[illegible]	[illegible]	24.381	[illegible]
3	102.0	91.5	[illegible]	[illegible]
4	102.0	99.2	13.106	[illegible]
5	94.0	98.4	24.181	200.12
6	103.0	99.5	[illegible]	[illegible]
7	102.1	100.1	12.106	[illegible]
8	91.3	99.[illegible]	24.498	[illegible]

AVG. COMP. = 60 DB MAX. COMP. = 107 DB
ARITHMETIC MEAN = [illegible]
AVG. [illegible] =
VARIANCE =

AMPLITUDE DISTRIBUTION

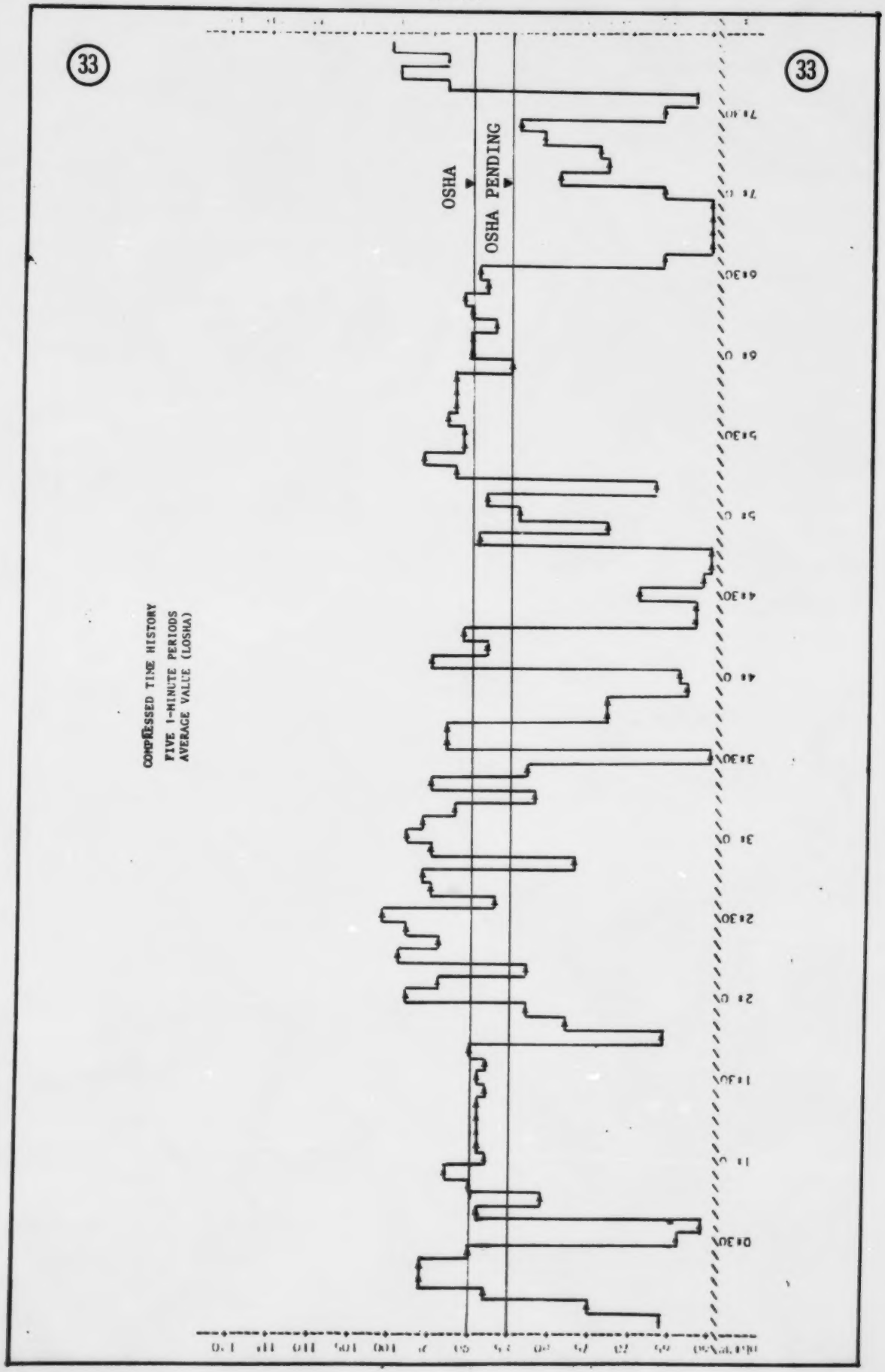
(33)

FREQUENCY DISTRIBUTION

(33)

FREQUENCY		GROUP
NUMBER	PER CENT	
53	11.0	60 To 64
14	2.9	65 To 69
14	2.9	70 To 74
3	.6	75 To 79
3	.6	80 To 84
45	9.4	85 To 89
54	11.3	90 To 94
68	14.2	95 To 99
120	25.0	100 To 104
106	22.1	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480


33
33
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(34)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1212    60    64     4     1
     102     115200  480
 61  77  60  60  60  60  60  60  60  60  70  64  67  60  60
 81  78  61  66  70  70  64  66  68  64  61  69  70  74  76  74
 76  71  67  72  63  70  65  69  65  66  68  67  66  67  75  69
 78  89  96  90  95  92  95  93  91  93  92  95  97  92  92  91
 91  93  81  81  82  89  95  93  93  93  94  99  96 105 103  94
 95  96  98  94  95  95 102 107 108 103 104 108 107 106 107 106
108 106 107 106 105 104 106 107 107 107 107 105 104 101  92  92
 74  85  93  96  91  92  99 104  91  93  99  97  94  87  97  91
 90  97 100  96 100 103  94  94  97  97  96  92  95  98 105 108
105 107 107 106 104 105 106 104 105 104  99 105 102 105 103  96
100 104 105  98  96 102 103  96 102 100 101 100 103 103 104 103
102 104 105 105 105 102 104 105 105 105 105 105 106 106 105 107
105 107 109 106 107 106 107 104 107 105 104 106 103  97  98 100
103  97 105 108 106 100 102 100 101 103 104 101 104 105 105 104
 97 106 106 100  95 103  90  89  89  89  89  89  98 101 107 106
108 107 107  99  99  99  99  96 100  95  96 100 100 100  98 104
105 105 102 107 106 107 108 107 106 108 109 108 109 106 104 101
101  98  91  85  89  92  60  82  68  60  98  96 100  99  96  92
 90  90 103 102 102  92  84  65  60  60  60  60  61  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  62  71  81  89  93  99  93  92 101 107  94  92  91  94 108
109 109 111 112 112 111 110 111 109 110 110  99  89  89  89  89
 89  90  91 104 106  89  89  89  89 104 108 108 107 108 106 105
104 110 108 108 110 110  98  91  91  91 106 107 103  93  93  94
 93  93  92  92  92 100 107  93  93  93  93  93  93  93  94  94
 94 103 102  92  91  91  90  92 104 108 108 109 107 107 108 107
108 108 108 108 109 110 108 106 110 105 107 106 102 102 104 103
100 103  98 103 109 109 111 109  99 107 102  92  87  85  88  88
 88  89  85  81  78  79  73  72  74  72  75  76  73  74  76  72
 74  74  79  70  67  68  76  72  73  66  70  75  71  70  73  76
%EOF
```

(34)

```
ENTER LOG DATE (DD/MM/YR) : 25/07/79

ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 7618
 ENTER JOB CODE (3 CHARS) : TRD
```

```
   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : 00000
SERIAL NUMBER : 1212                       JOB CODE : TRD
      BASELINE : 60 DB                     USER CODE : 7618
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:25
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		SONE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	82.0	82.0	4.141	4.14
2	101.4	96.9	61.122	65.26
3	101.8	99.9	64.771	130.03
4	103.7	101.4	83.072	212.11
5	101.2	100.6	59.341	271.45
6	100.5	100.6	54.862	325.31
7	103.3	101.0	79.240	404.54
8	99.6	100.9	47.209	451.75

MIN. COMP. = 60 DB MAX. COMP. = 112 DB
ARITHMETIC MEAN = 92 DB
STD. DEVIATION = 15 DB
VARIANCE = 225 DB

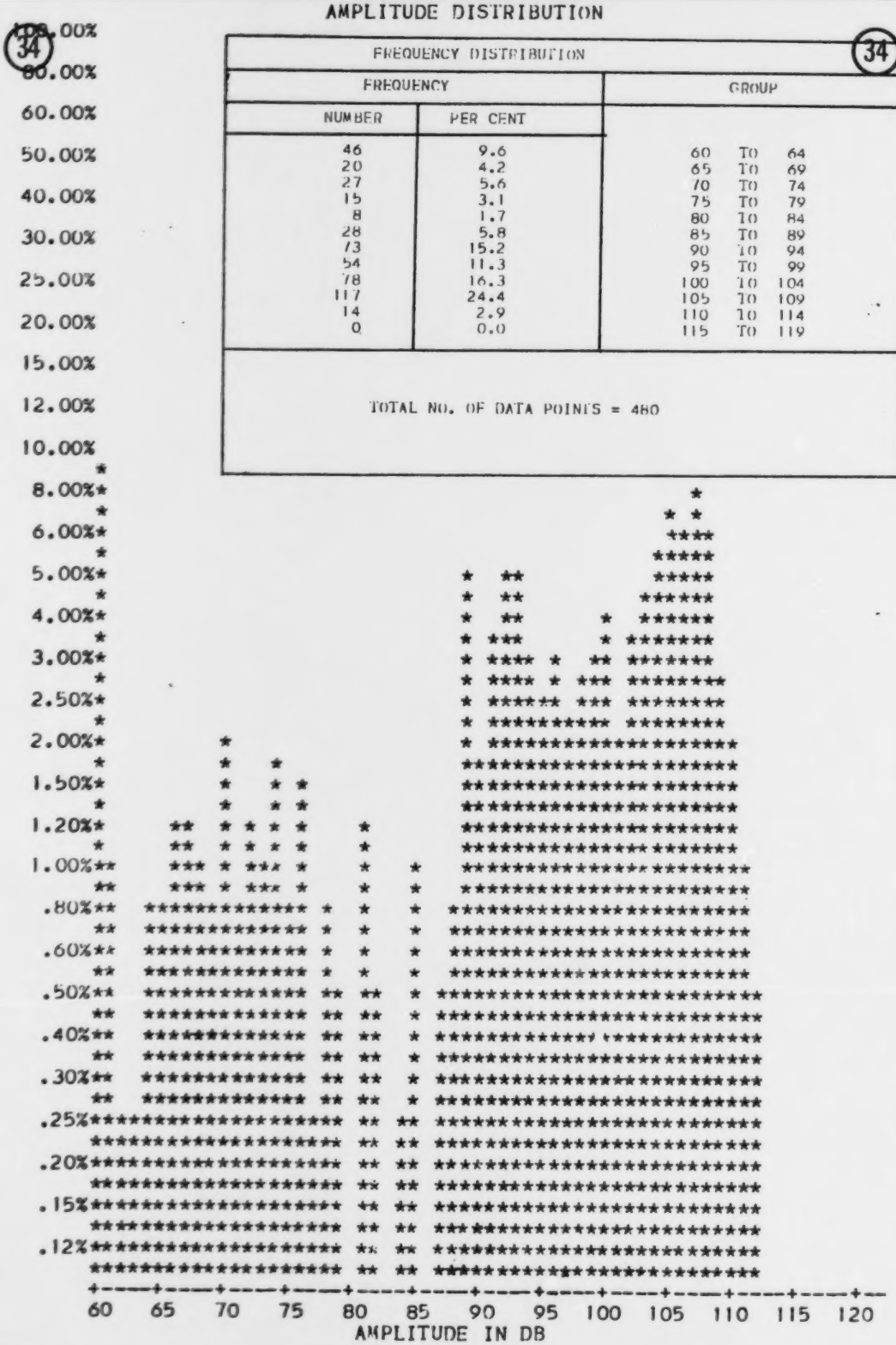
AMPLITUDE DISTRIBUTION

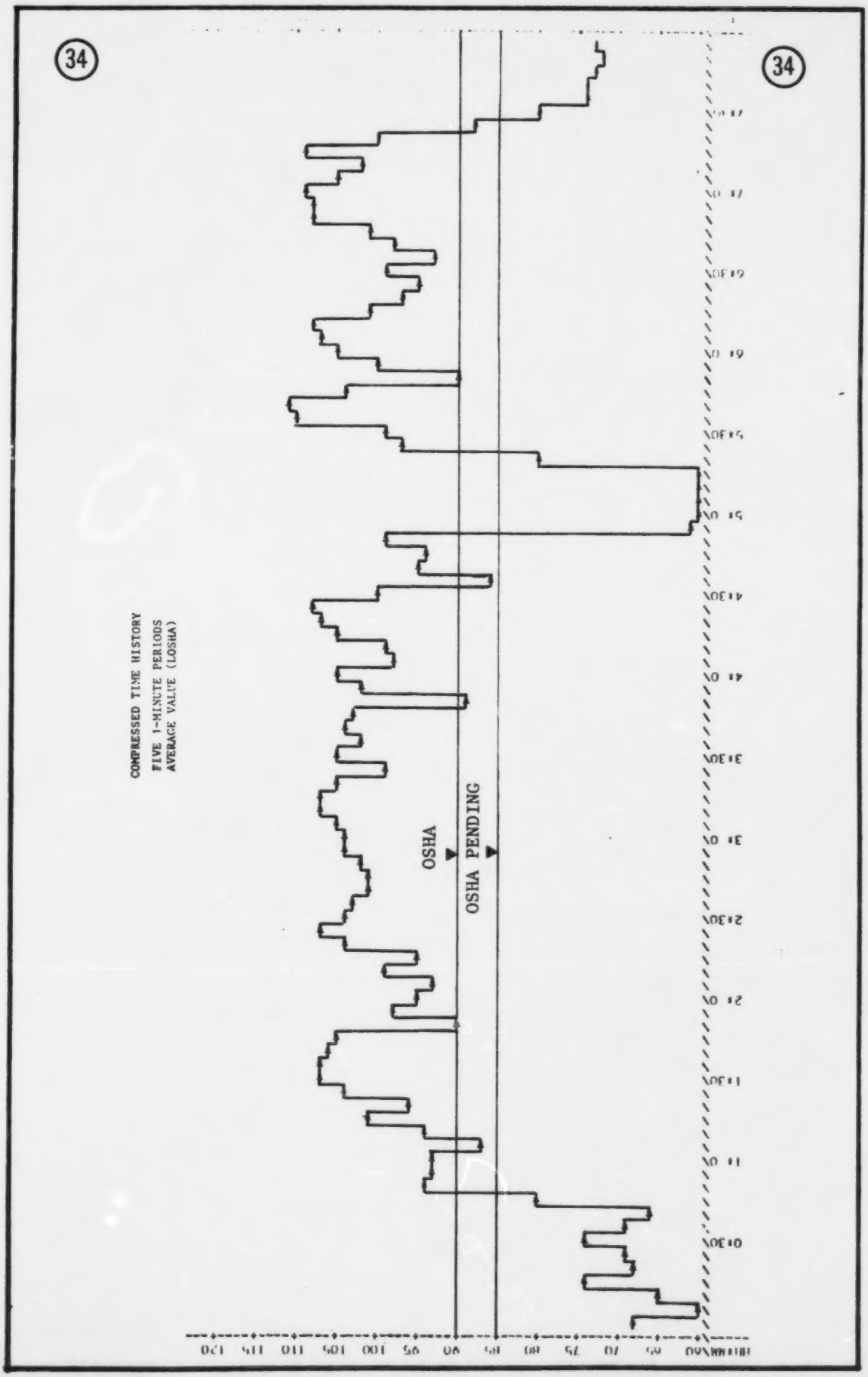
(34)

FREQUENCY DISTRIBUTION (34)

FREQUENCY		GROUP
NUMBER	PER CENT	
46	9.6	60 TO 64
20	4.2	65 TO 69
27	5.6	70 TO 74
15	3.1	75 TO 79
8	1.7	80 TO 84
28	5.8	85 TO 89
73	15.2	90 TO 94
54	11.3	95 TO 99
78	16.3	100 TO 104
117	24.4	105 TO 109
14	2.9	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




34
34
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1 0
1:30
2 0
2:30
3 0
3:30
4 0
4:30
5 0
5:30
6 0
6:30
7 0
7:30
dBA
60
65
70
75
80
85
90
95
100
105
110
115
120

(35)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1218    60    64     4     1
     109     115200  480
  73  64  64  60  60  60  60  63  60  60  60  61  60  62  63  61
  60  60  60  60  60  60  60  60  61  62  66  61  80  96  96  89
  79  80  88  85  94  96 100  97  88  87  93  98  99  97  99 100
  97  98  85  96  95  95 101 100  96  92  94 100  94  84 100 102
  98 101  95 100  97 100  97  65  61  69  62  60  60  61  70  64
  62  63  60  60  60  63  60  75  69  63  87  74  65  62  79  96
  95  98 101 100  91 100  99  98  94  91  93  84  97  96  96  75
  88  82  78  72  76  83  79  84  86  80  96  98  93  91  94 100
  91  77  84  72  75  61  65  71  84  85  93 101 103  97 102 100
  79  96  94  67  68  67  68  69  94  98  83  68  69  77  70  77
  89 101 100 101  99  99  98  95  97  99  87  97  89  89  72  60
  62  85  68  65  82  61  61  62  60  72  66  68  75  64  82  75
  80  85  96  95  93  97  98  99  71  87  69  67  66  70  69  66
  99  98  98 100  96 102  93  86  80  88  68  74  82  87 101  98
  97  99  90 100  99  97  87 100  94  85  84  88  85  91  96 100
  97  95  94  99  98  92  79  98  97  98  94  76  73  65  64  65
  68  65  64  63  64  61  60  60  60  61  60  60  61  63  60  60
  61  62  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  61  60  60  60  60  60  60  60  60  60  60  63  60  78
  62  60  60  60  60  60  60  60  60  60  60  60  60  60  74  60  62
  67  64  66  61  61  62  67  65  66  62  65  69  65  62  95  98
 103 101 100  94  75  69  69  97  98  99  95  90  94  97 101 101
  92  98  98  98 100  99 100 100  93  94  88  77  69  82  87  86
  92  96  99 100  95  95  78  94  85  99  94  94  94  93  82  62
  88  84  91  98  97 103  89  99  83  99  99  97  83  82  83  98
 100  94  96  98  60  60  79  85  78  63  60  68  91  83  88  60
  60  92  97  97 100 101  93  85  84  82  83  69  93 102  95  92
  91  67  79  93  98  89  89  90  99  98  96  97  95  82  95  99
 101  98 101  97 100 101  92  67  67  67  67  60  77  70  68  70
  74  67  71  81  99  99  99  99  91  98  99  93  98  95  98  98
%EOF


ENTER LOG DATE (DD/MM/YR) : 13/08/79

ENTER SITE CODE (5 CHARS) : 00000

ENTER USER CODE (4 CHARS) : 7409
 ENTER JOB CODE (3 CHARS) : GEO


   DATA LOGGED :13  AUG 1979
        LOGGER : DB-301/26
SERIAL NUMBER : 1218
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8: 0: 0

DATA ANALYZED : 20 SEPT 1979
    SITE CODE : 00000
     JOB CODE : GEO
    USER CODE : 7409
    THRESHOLD :  80 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =   0: 0:27

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOGIA                    %DOSE
HOUR     CURRENT  CUMULATIVE     CURRENT  CUMULATIVE
   1        91.0        91.0      14.313       14.31
   2        91.8        91.4      16.078       30.39
   3        92.9        91.9      18.689       49.08
   4        92.5        92.1      17.576       66.66
   5        84.0        91.0       5.415       72.07
   6        91.5        91.1      15.481       87.55
   7        92.7        91.4      18.068      105.62
   8        94.4        91.8      22.892      128.51
MIN. COMP. =  60 DB          MAX. COMP. = 103 DB
ARITHMETIC MEAN =  81 DB
STD. DEVIATION =  15 DB
VARIANCE =255 DB
```

(35)

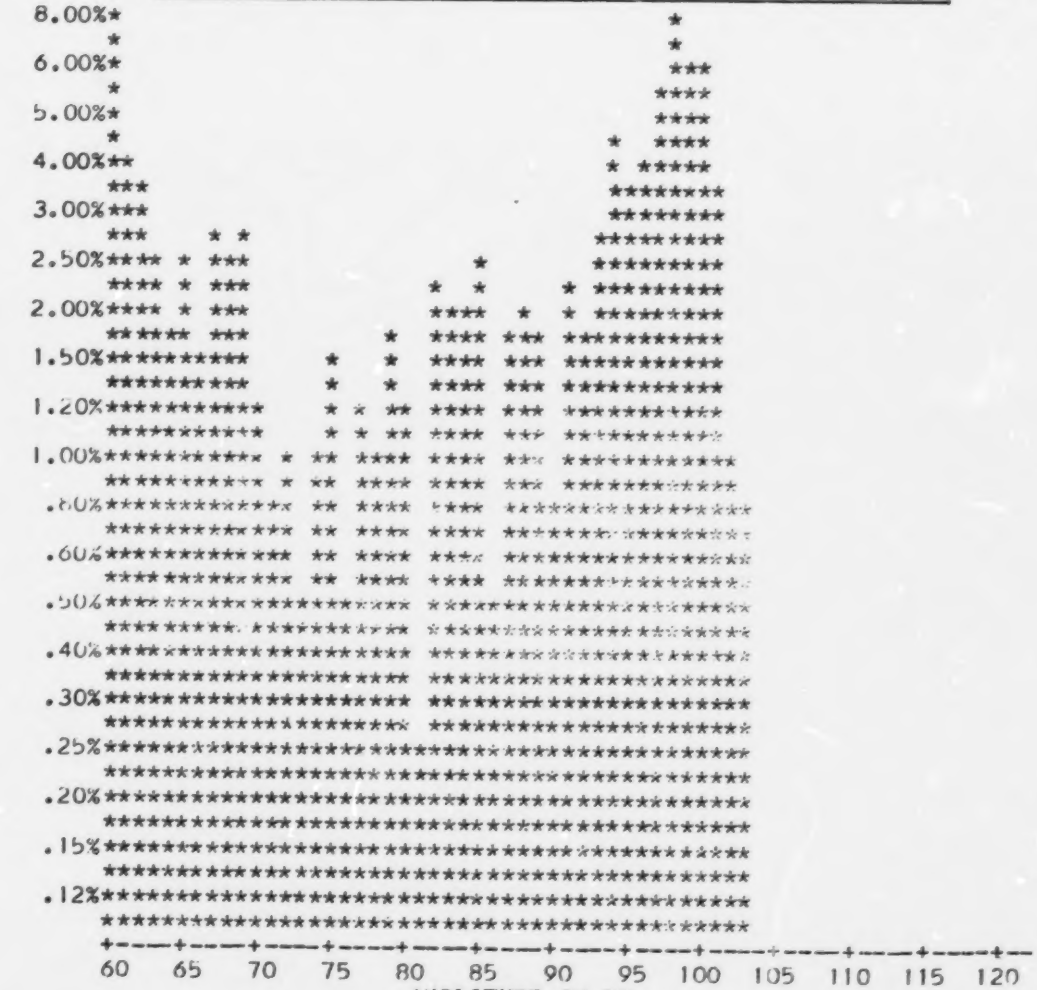
AMPLITUDE DISTRIBUTION

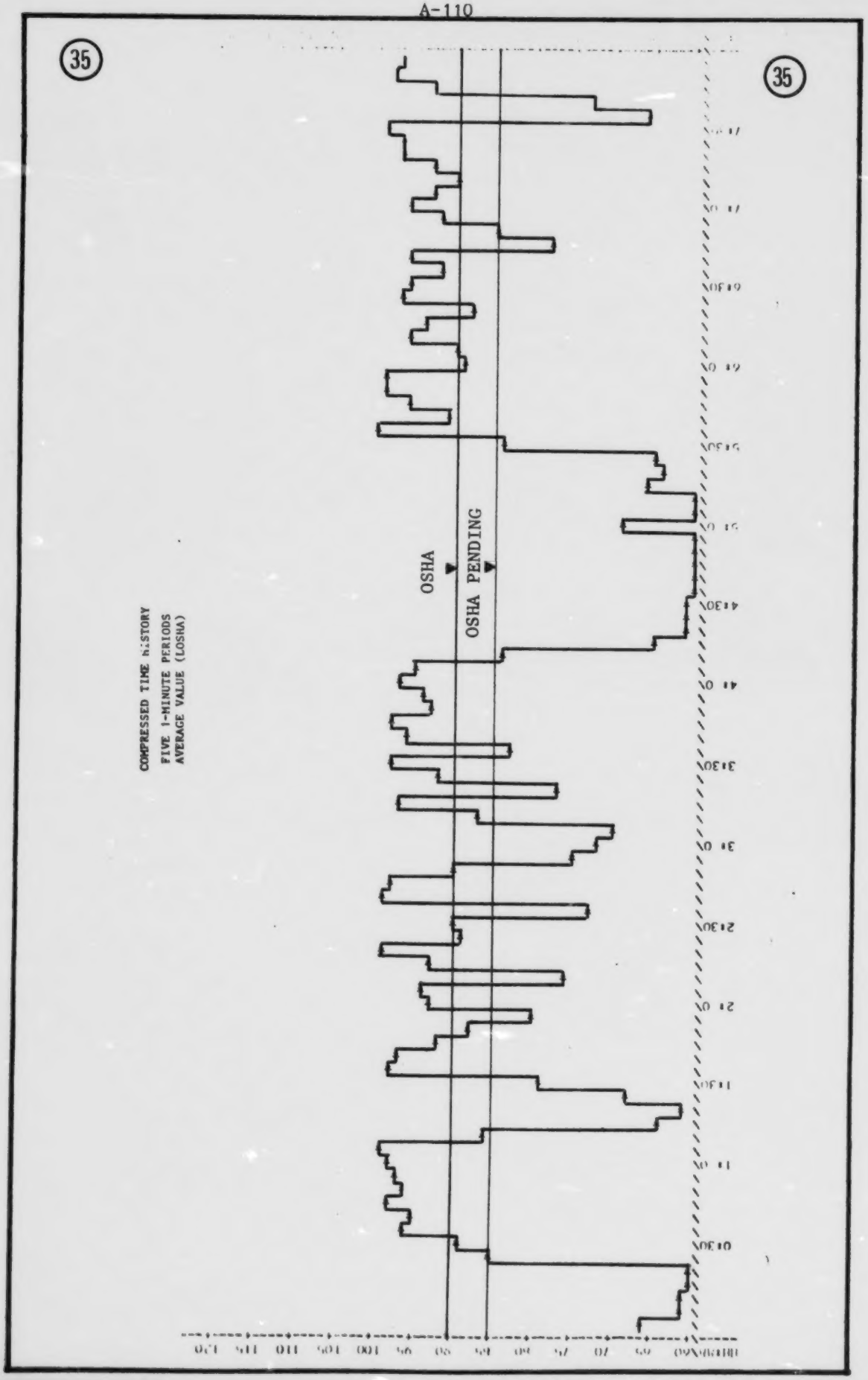
(35)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
124	25.8	60 To 64
48	10.0	65 To 69
18	3.8	70 To 74
24	5.0	75 To 79
31	6.5	80 To 84
34	7.1	85 To 89
48	10.0	90 To 94
108	22.5	95 To 99
45	9.4	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480

(35)




35
35
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dBA
60
65
70
75
80
85
90
95
100
105
110
115
120
01:30
11
11:30
21
21:30
31
31:30
41
41:30
51
51:30
61
61:30
71

(36)

```
PLACE TAPE IN READER THEN TYPE A <SPACE> AND S <RETURN>
  1  26  80  1226    60    64     4     1
     396      115200  480
  60  60  66  61  60  60  61  60  62  61  60  64  74  61  75  82
  66  71  66  69  65  70  65  64  75  77  80  77  80  92  91  92
  93  93  93  96  93  97  92 100  97  96  99  98  97  95  78  80
  67  62  65  62  61  60  60  62  62  61  62  73  72  72  76  76
  76  71  76  80  67  72  76  73  72  62  60  63  63  71  64  74
  78  78  78  77  82  93  87  92  91 103  94  81  82  82  99  99
  88  90  91  90  92  89  88  89  87  87  87  85  86  90  94  90
  91  95  92  87  92  92  84  86  87  87  86  87  89  89  89  87
  90  90  90  85  89  89  88  87  97 100 101  96  94  97  91  87
  95  91  90  91  98  99  95  92  93  93  92  92  93  91  97  95
  90  94  91  87  86  89  86  89  95  93  89  89  96  95  96  99
  96  95  96 102 103 103 102 102  98  94  90  92  93  92  92  99
  89  [illegible]  93  96  90  96  93  89  91  94  95  99 105 107 100
  96  98  94  96  96  96  97  96  96  97  94  95  93  94  96  96
  95  94  93  94  93  96  92  90  92 100  87  87  89  86  98  99
  97 104  99  97  98  97  98  98  97  98 100 100  98  97  97  97
  98  98  97  98  97  97  98  93  95  96  95  83  85  81  65  60
  60  61  60  60  60  63  60  64  70  61  62  64  60  61  60  68
  60  60  60  60  60  60  61  60  60  61  60  60  60  71  64  73
  76  76  78  86  76  77  75  70  83  79  77  79  74  81  98 102
 100 101  99  95  91  88  91  86  88  78  88  82  87  87  85  84
  86  87  92  92  95  92  85  76  82  83  80  75  81  85  83  84
  80  83  82  83  83  86  84  84  82  79  81  81  76  77  81  84
  85  81  83  82  77  72  72  76  80  83  84  92  85  87  87  87
  82  81  88  92  92  93  88  89  83  89  90  91  88  83  83  84
  80  81  82  81  85  84  81  82  84  81  86  86  89  91  96  81
  81  83  86  84  86  87  84  84  83  83  84  81  81  81  83  84
  82  86  87  81  80  82  81  87  92  91  92  87  92  95  88  94
  87  95  80  79  77  77  78  76  80  80  83  89  99  92  97 100
  99  99 100  97  89  89  86  80  86  88  88  94  92  94  95  81
%EOF
```

(36)

ENTER LOG DATE (DD/MM/YR) : 13/07/79

ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 2614
ENTER JOB CODE (3 CHARS) : 211

DATA LOGGED :13 JULY 1979
LOGGER : Db-301/26
SERIAL NUMBER : 1226
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 12 SEPT 1979
SITE CODE : CC210
JOB CODE : 211
USER CODE : 2614
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 1:39

TIME HISTORY ANALYSIS

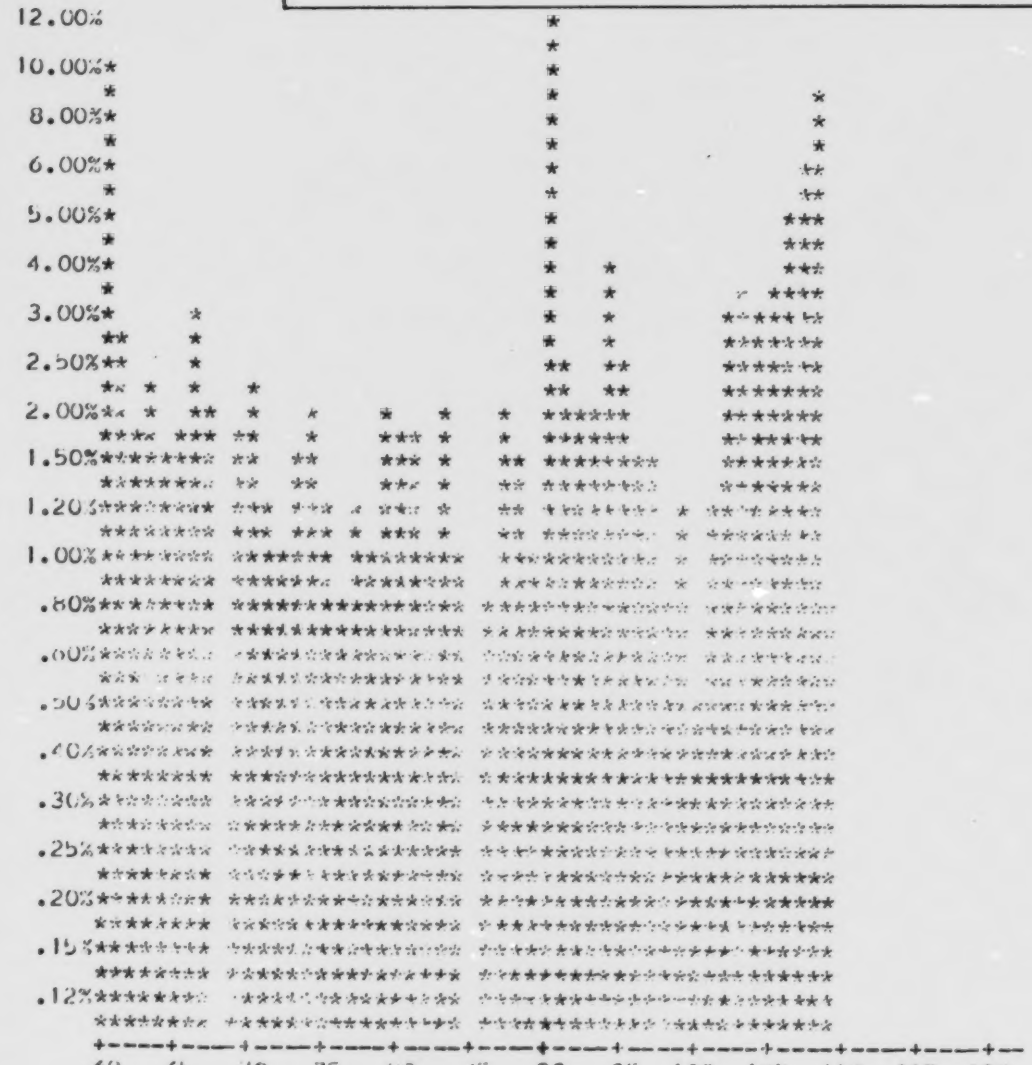
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL TIME = 30 Hr / 0 Min
EXCEEDANCE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

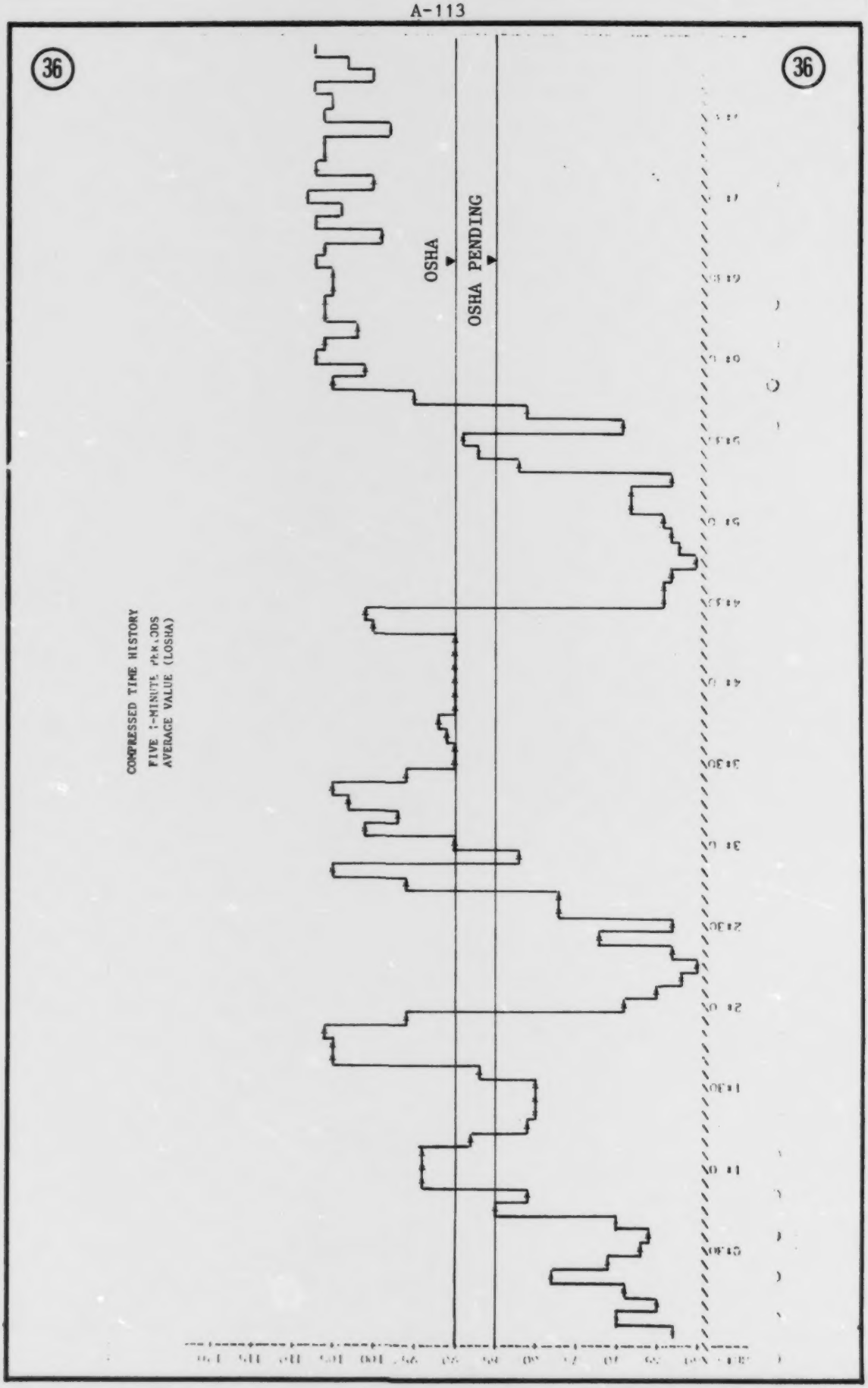
TIME	LOGIC		LOGIC	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	87.6	87.6	8.923	8.92
2	88.3	87.9	9.93	18.73
3	93.3	90.2	19.621	38.42
4	96.3	91.3	38.137	76.56
5	92.2	92.3	17.023	85.58
6	89.3	91.7	9.017	95.60
7	89.9	91.1	9.713	105.31
8	90.1	91.0	13.671	118.98

MIN. CODE = 60 DB MAX. CODE = 107 DB
ARITHMETIC MEAN = 84.50
STD. DEVIATE = 11.09
VARIANCE = 123.00

(36)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP (36)
NUMBER	PER CENT	
53	11.0	60 TO 64
14	2.9	65 TO 69
19	4.0	70 TO 74
36	7.5	75 TO 79
79	16.5	80 TO 84
87	18.1	85 TO 89
82	17.1	90 TO 94
89	18.5	95 TO 99
19	4.0	100 TO 104
2	.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




36
36
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE :-MINUTE PEAKODS
AVERAGE VALUE (LOSHA)

(37)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1212 60 64 4 1
1111 115200 480

60	60	60	60	60	62	62	60	60	60	60	62	60	60	60	60
61	63	60	60	63	60	60	60	60	64	61	60	60	60	60	77
73	74	91	98	94	95	92	94	97	88	88	85	90	81	91	97
99	100	101	101	102	102	102	103	100	102	100	94	95	97	103	102
103	102	97	99	103	102	102	102	102	102	101	102	94	100	103	105
104	105	104	103	102	102	102	102	103	95	99	102	101	104	98	96
94	93	95	99	94	100	97	97	94	95	94	103	103	102	102	99
94	95	100	103	101	99	99	95	100	99	100	97	96	100	100	100
85	81	81	81	82	86	81	81	81	81	83	81	81	81	81	81
81	81	81	82	81	81	81	82	81	81	81	81	81	81	81	81
81	81	83	81	81	81	81	81	81	85	84	81	82	82	85	97
100	101	101	101	80	94	102	102	100	101	101	100	101	102	103	103
102	103	102	102	103	103	101	103	104	103	104	104	102	60	63	60
60	100	101	101	102	102	104	101	106	104	104	100	101	100	101	96
97	104	101	103	103	102	102	101	102	101	98	87	61	60	60	60
60	60	60	60	60	65	90	104	104	102	102	103	104	103	95	77
71	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	91
85	98	104	102	99	100	103	102	103	103	103	104	104	104	103	104
102	102	104	104	104	104	104	104	101	105	100	100	100	101	100	102
102	101	103	103	103	101	103	100	102	103	103	100	100	101	102	102
104	98	93	94	94	100	101	105	100	102	104	86	83	88	91	65
60	60	60	60	60	92	101	99	100	99	101	104	101	102	102	102
102	102	102	102	101	101	102	105	99	96	96	93	93	64	74	60
60	65	78	99	98	101	105	106	104	102	105	102	88	60	60	60
60	60	60	60	92	105	103	104	105	105	104	104	105	106	105	106
104	104	104	104	104	104	104	103	105	105	105	105	104	104	104	102
86	95	96	101	105	102	100	103	101	97	98	96	103	104	101	110
106	112	113	111	109	111	99	97	97	97	99	107	108	74	91	93
89	92	90	88	90	91	97	87	92	89	92	92	86	76	70	80

%EOF

(37)

ENTER LOG DATE (DD/MM/YR) : 20/08/79

ENTER SITE CODE (5 CHARS) : 00310
ENTER USER CODE (4 CHARS) : 7759
ENTER JOB CODE (3 CHARS) : 212

DATA LOGGED :20 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1212
[illegible]
[illegible]
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 00310
JOB CODE : 212
USER CODE : 7759
[illegible]
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

[illegible] EXPOSURE DOSE (E.D.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
[illegible]
[illegible]
[illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

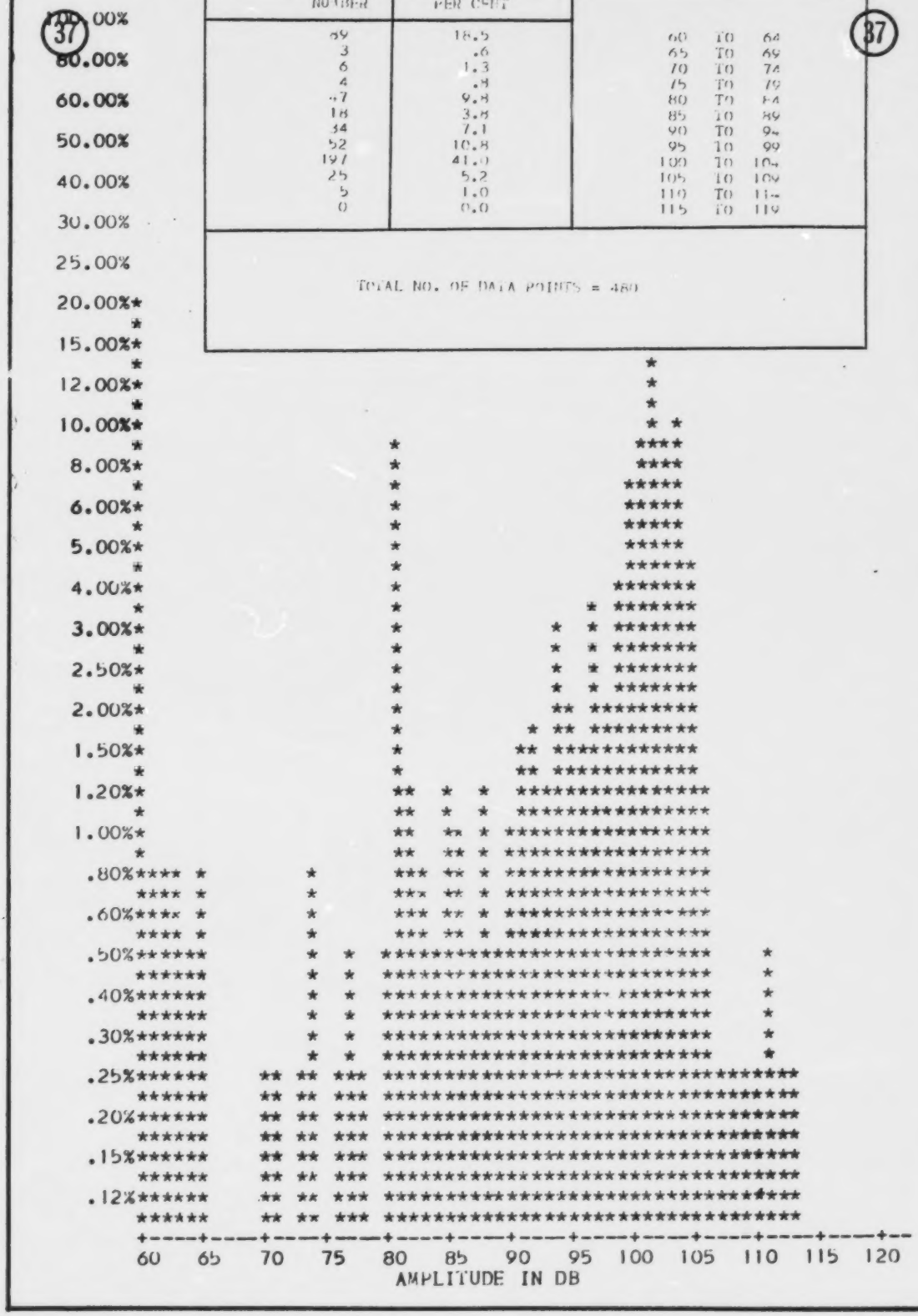
TIME	DOSE		DOSE	
MODE	INCREMENT	CUMULATIVE	INCREMENT	CUMULATIVE
1	91.6	91.6	15.067	15.07
2	100.5	97.4	53.893	69.55
3	90.5	95.7	13.775	83.33
4	100.6	97.3	54.543	137.88
5	94.3	96.8	22.660	160.54
6	100.6	97.6	54.424	214.96
7	100.7	98.1	54.947	269.91
8	100.2	98.4	67.628	337.54

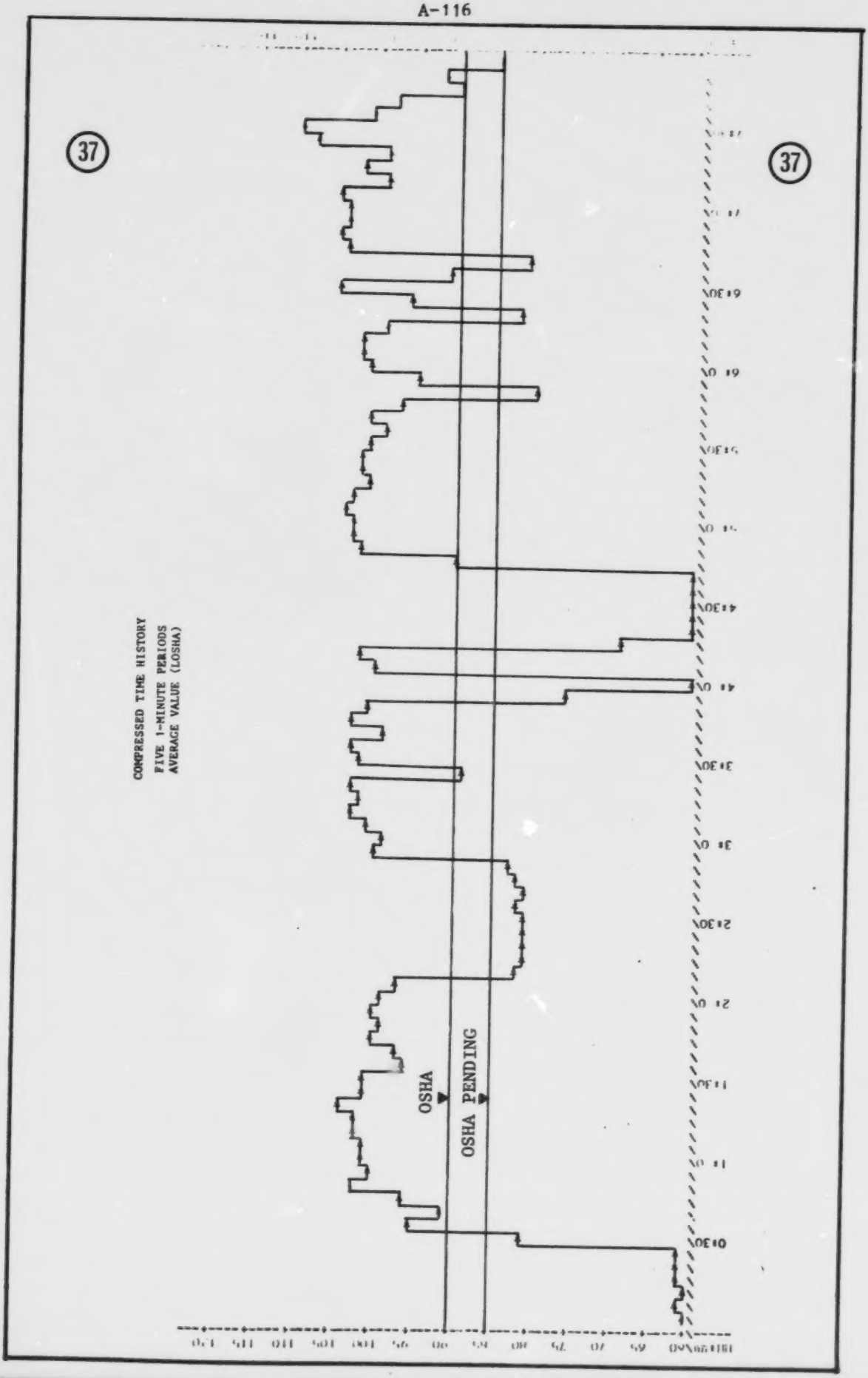
MIN. COMP. = 60 DB MAX. COMP. = 113 DB
ARITHMETIC MEAN = 90 DB
STD. DEVIATION = 16 DB
VARIANCE = [illegible]

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
89	18.5	60 TO 64
3	.6	65 TO 69
6	1.3	70 TO 74
4	.8	75 TO 79
47	9.8	80 TO 84
18	3.8	85 TO 89
34	7.1	90 TO 94
52	10.8	95 TO 99
197	41.0	100 TO 104
25	5.2	105 TO 109
5	1.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




37
37
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(38)

1 26 80 1225 60 64 4 1
16 115200 480

81	74	60	61	60	60	60	66	63	66	60	60	60	64	63	60
60	63	60	60	61	60	60	60	68	73	75	60	74	67	73	71
72	70	65	73	72	73	73	73	76	72	75	73	65	74	77	73
76	70	71	77	71	76	72	69	60	65	68	63	70	73	74	80
77	71	74	75	67	79	77	70	64	70	71	67	68	66	67	67
69	65	72	70	67	67	70	64	73	69	76	70	70	72	71	70
70	62	60	67	60	60	67	62	62	65	68	74	65	65	60	60
60	60	60	60	60	65	70	73	72	73	72	86	92	90	90	92
91	91	91	94	93	93	93	92	91	92	92	91	95	87	93	89
69	70	70	68	62	61	61	61	62	60	60	64	60	60	60	60
60	84	70	60	60	60	60	60	60	60	90	91	94	91	90	95
99	100	99	99	101	100	100	98	100	97	95	102	98	97	100	100
100	99	99	96	99	98	98	96	98	99	100	97	97	97	95	96
98	99	93	95	97	96	97	96	96	96	87	93	96	97	99	98
97	98	101	93	96	95	95	93	97	95	95	98	94	91	84	80
76	67	69	69	81	96	100	99	98	97	100	99	97	96	99	100
102	98	96	92	97	99	101	99	99	101	96	79	60	60	76	90
91	90	93	97	97	99	100	100	99	97	101	100	99	99	98	98
99	99	99	98	98	99	99	98	95	94	96	97	97	97	97	97
96	97	98	98	98	97	98	97	97	97	96	96	90	86	97	97
98	97	97	98	96	98	97	97	99	98	99	98	96	97	97	97
96	99	99	99	99	100	94	97	98	98	98	96	97	84	74	60
60	60	68	60	65	60	60	60	60	60	60	62	60	61	60	60
60	60	60	60	60	60	60	60	60	70	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	63	60
62	75	60	60	60	60	60	60	60	60	60	60	60	60	60	78
89	95	97	99	99	99	99	98	99	97	96	96	97	97	95	96
95	96	96	98	97	95	97	98	98	99	97	97	96	98	100	100
99	99	100	100	101	101	101	100	97	92	93	94	94	94	96	96
97	100	102	100	99	100	100	100	101	100	98	101	101	101	102	100

480

(38)

ENTER LOG DATE (MO/DY/YR) : 13/09/79
ENTER SITE CODE (5 CHARS) : 30300
ENTER USER CODE (4 CHARS) : 7953
ENTER JOB CODE (3 CHARS) : 120

DATA LOGGED :13 SEPT 1979
LOGGER : 33-301/26
SERIAL NUMBER : 1225
PARITY : ODD
DYNAMIC RANGE : 5V-0V
SAMPLING RATE : 4/SEC
TEST DURATION = 0: 8: 0

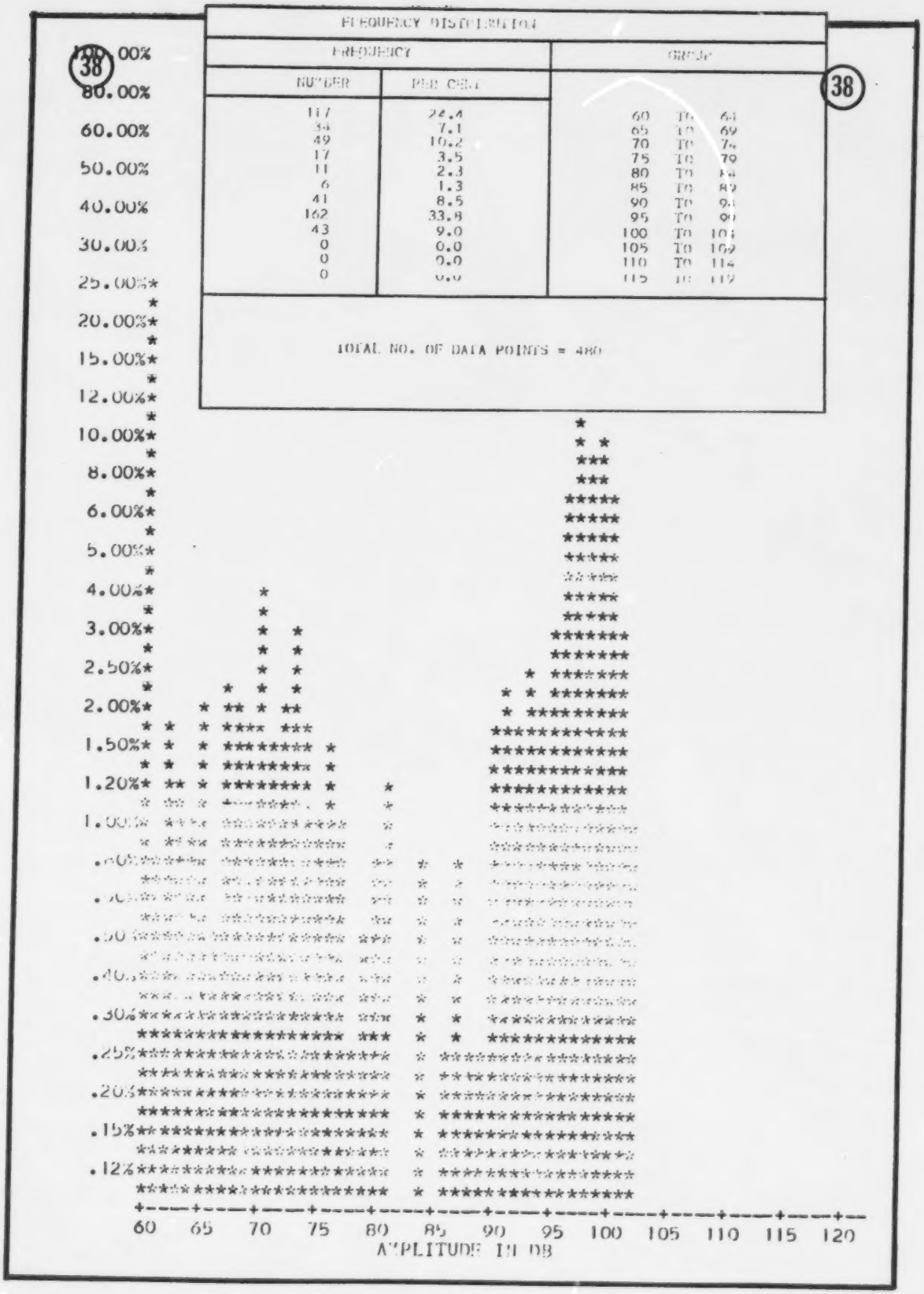
DATA ANALYZED : 27 SEPT 1979
SITE CODE : 30300
JOB CODE : 120
USER CODE : 7953
CHANNEL : 64
TOTAL SAMPLES = 115200
SAMPLED AT = 0: 0: 0

LIFE HISTORY ANALYSIS

NOISE MARGIN = 1.85 (N.M.I.) CALCULATED
WITH RESPECT TO THE POINT:
HOUR NUM = 7 DAY NUM = 3
NUMBER OF (GOOD) DAYS = 3
NUMBER OF (GOOD) HOURS = 60
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

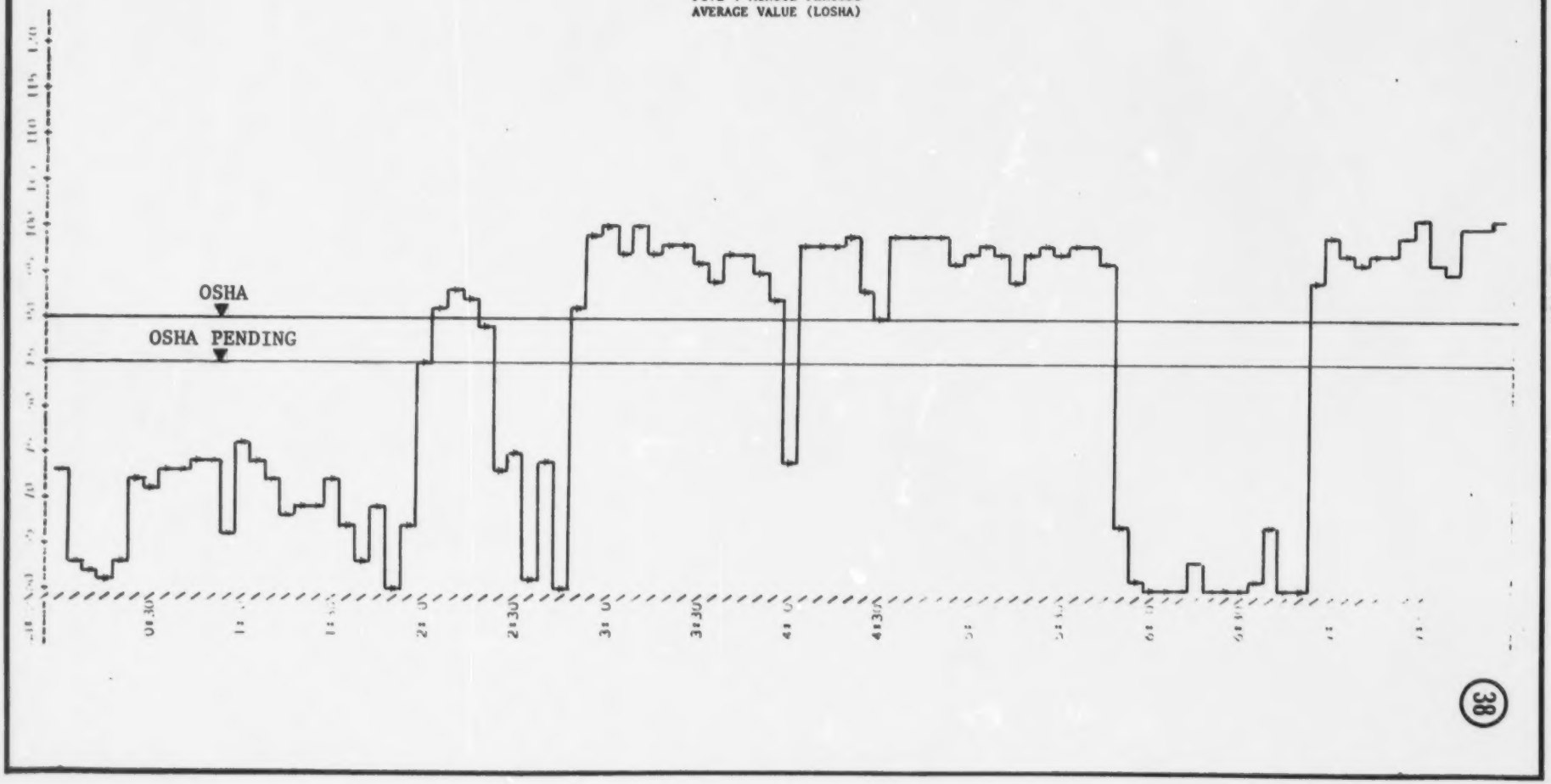
HOUR	N.M.A. CUMULATIVE	N.M.A. CUMULATIVE	SIGNAL CUMULATIVE	SIGNAL CUMULATIVE
1	70.1	70.1	.795	.80
2	69.9	70.0	.775	1.57
3	69.7	69.9	1.575	3.14
4	97.1	83.3	33.564	40.63
5	96.9	91.6	32.745	73.36
6	95.8	92.5	26.107	100.48
7	77.2	91.6	2.129	102.61
8	96.4	92.9	40.199	142.81

MIN. COMP. = 60 DB MAX. COMP. = 102 DB
ARITHMETIC MEAN = 92 DB
STD. DEVIATION = 1
VARIANCE = 3


FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
117 24.4 60 TO 64
34 7.1 65 TO 69
49 10.2 70 TO 74
17 3.5 75 TO 79
11 2.3 80 TO 84
6 1.3 85 TO 89
41 8.5 90 TO 94
162 33.8 95 TO 99
43 9.0 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
38
38
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB

COMPRESSED TIME HISTORY

FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)



38

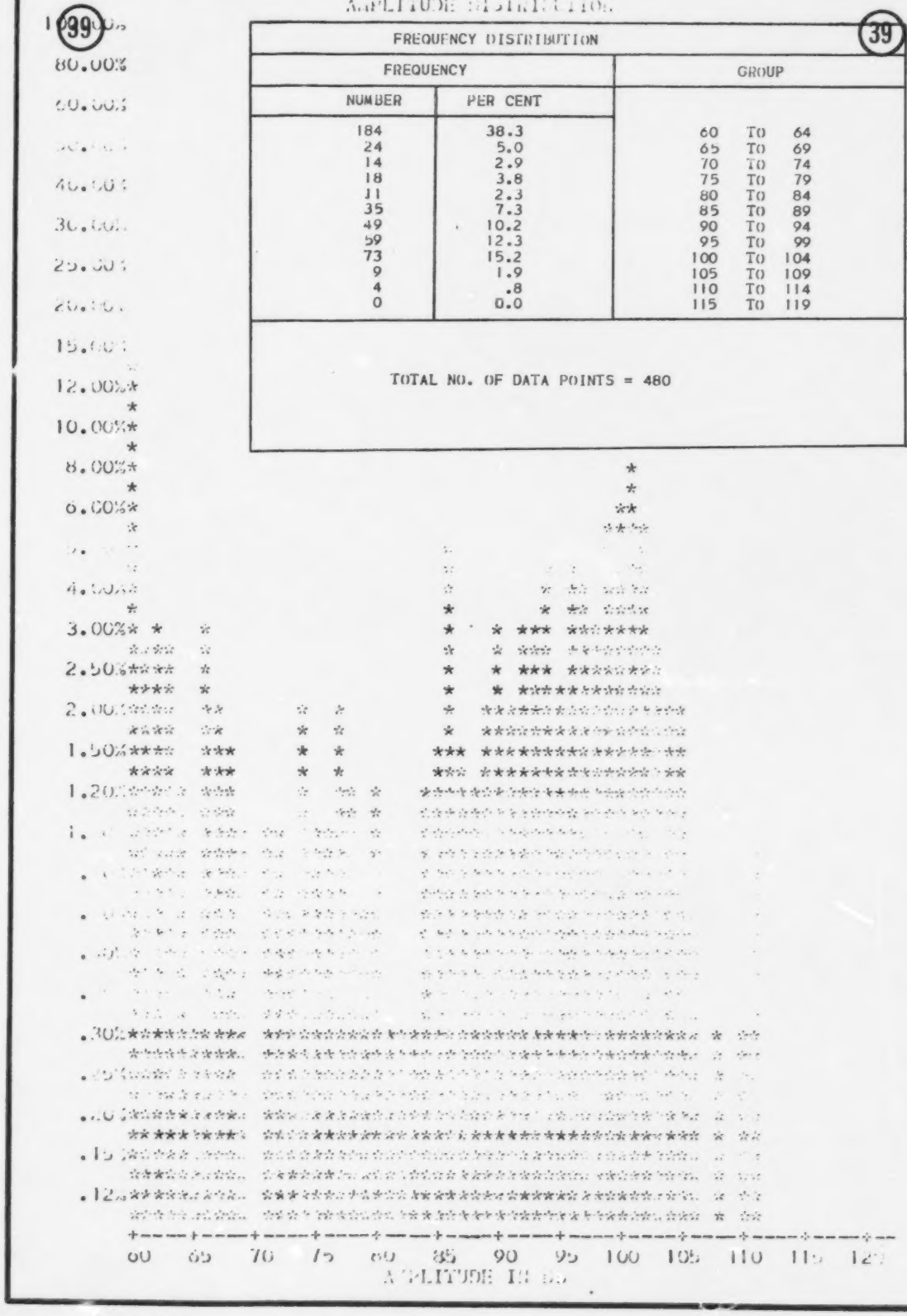
(39)

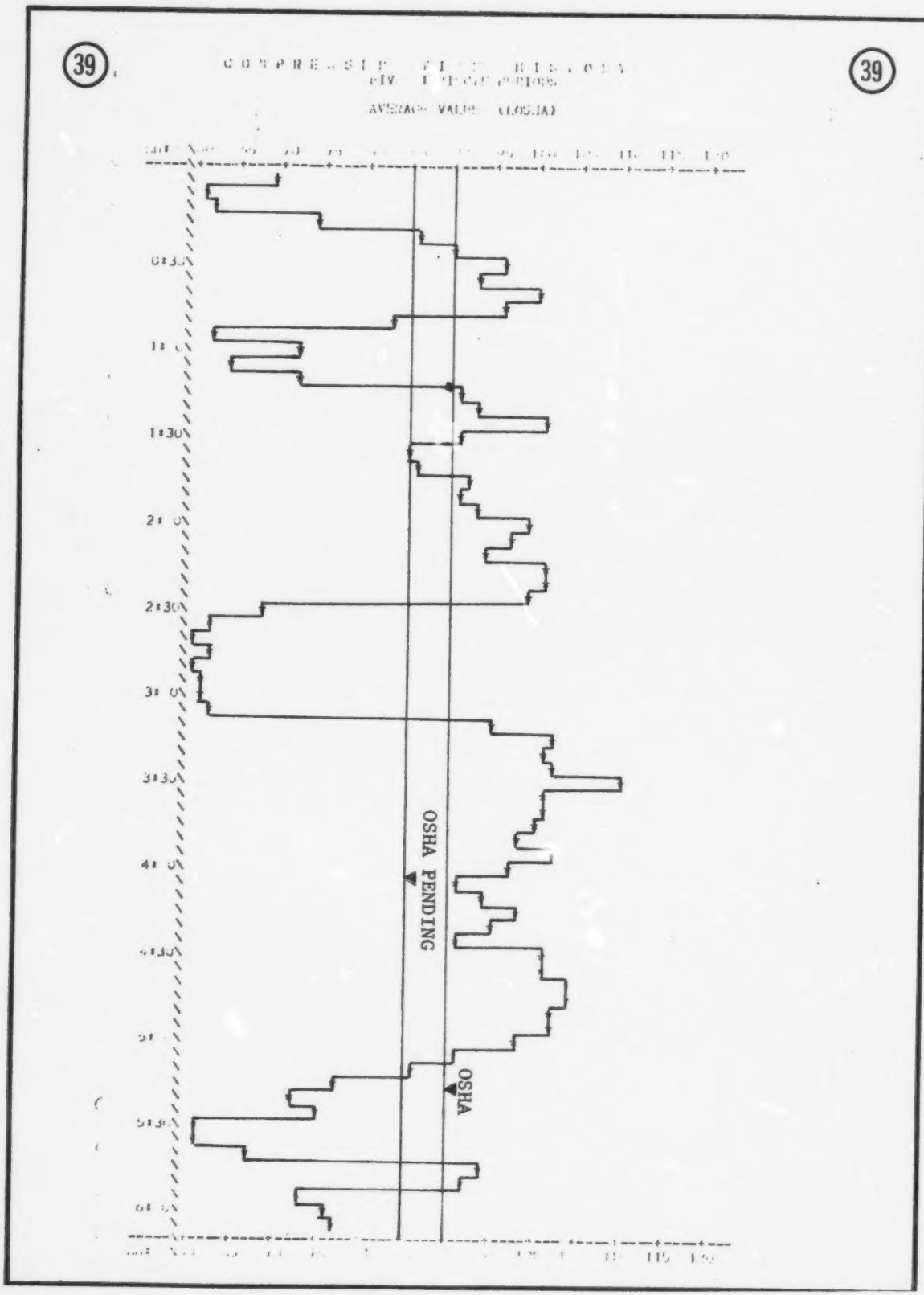
```
 1  26  80  1217                    4     4     1
 41610          1350.4   3.2
 85  69  62  68  63  64  60  60  62  62  64  61  60  61  63  71
 77  74  69  67  67  64  91  90  89  90  91  89  90  91  92  97
 99  96  96  94  95  92  93  94 100 101 101 102  97 100  97  99  94
 90  87  87  85  81  80  75  60  66  62  60  60  61  77  60  62
 80  82  80  80  80  84  85  86  71  71  77  74  74  73  94  96
 92  93  93  90  92 101 100 101 101 100  99  97  95  95  94  96
 96  96  96  96  96  96  96  96  96  96  96  96  96  96  96
```

APTITUDE DISTRIBUTION

99

FREQUENCY DISTRIBUTION		39
FREQUENCY		GROUP
NUMBER	PER CENT	
184	38.3	60 To 64
24	5.0	65 To 69
14	2.9	70 To 74
18	3.8	75 To 79
11	2.3	80 To 84
35	7.3	85 To 89
49	10.2	90 To 94
59	12.3	95 To 99
73	15.2	100 To 104
9	1.9	105 To 109
4	.8	110 To 114
0	0.0	115 To 119
TOTAL NO. OF DATA POINTS = 480		




39
39
AVERAGE VALUE (LOG.IA)
OSHA PENDING
OSHA

(40)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1212   60   64    4    1
  10534     115200  480
  71  70  67  62  66  66  68  70  72  70  72  75  71  76  72  67
  66  75  68  62  74  69  64  68  67  63  65  65  71  66  67  70
  68  73  73  72  68  62  67  69  73  82  78  82  81  93  90  91
  88  90  90  95  94  99  92  93  92  92  93 101 101 100 100  99
 100 101 100  99  99 101 100  96 100 100 102  99  97  93  89  90
  93  90  91  88  88  90  91  95  91  96  90  94  95  94  97  93
  90  97  95  93  90  87  87  88  95  94  90  91  92  88  78  93
  96  98 100  97  97  97  96 101 101  97  91  90  87  96  98  94
  89  93  94  93  96  99  91 100  92  98  92  98  95  98  98  95
  94  93  96  98  96  99  97  98  96  96  96  95  98  97  97  97
  97  98  98  97  97  97  98  97  95  98  97  92  97  93  95  96
  96  94  96  98  94 100  99  97  97  96  95  96  93  97  98  94
  89  88  97  94  88  89  98  97  94  96  99  96  98  99  96  98
  96  98  96  99  99  98  99 100  97 100  99  98  98  99  98  97
  97  97  93  95  95  98  96  98  97  96  98  97  97  97  95  97
  99  99  97  94  89  94  95  94  97  95  95  96  95  95  93  96
  96  93  94  96  97  96  82  80  76  74  65  63  60  60  61  65
  61  62  60  60  66  63  63  60  66  70  69  61  63  67  66  60
  70  60  69  71  83  83  84  90  87  97 103 104 105  95  61  64
  60  63  67  63  65  62  95  98 100  99  99  92  93  93  92  96
  96  96  98  99 100 100  99  99  99  98  97  98  98  97  96  97
  97  96  97  97  98  86  97  99  97  98  97  98  98  99  99  98
 100  95  97  97  96  96  96  96  95  97  94  87  87  86  86  86
  87  68  60  60  60  60  60  74  86  85  85  85  84  60  60  60
  60  69  76  82  87  88  88  88  93  96  96  97  97  96  96  97
  97  96  97  98  97  96  97  97  97  95  94  97  99  97  97  98
  97  98  97  97  98  96  97  97  98  97  97  96  97  98  97  96
  99  98  96  97  96  97  93  96  93  89  89  90  90  91  97  95
  97  97  98  97  96  94  97  96  96  96  96  97 100  99 100 100
 100  94  98  97  99  98  99  97 102 102 101 101  99 100 100 101
%EOF
```

(40)

```
ENTER LOG DATE (DD/MM/YR) : 26/07/79
ENTER SITE CODE (5 CHARS) : 2SHAF
ENTER USER CODE (4 CHARS) : 4356
 ENTER JOB CODE (3 CHARS) : 212
```

```
   DATA LOGGED :26 JULY 1979
        LOGGER : DB-301/26
SERIAL NUMBER : 1212
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8: 0: 0

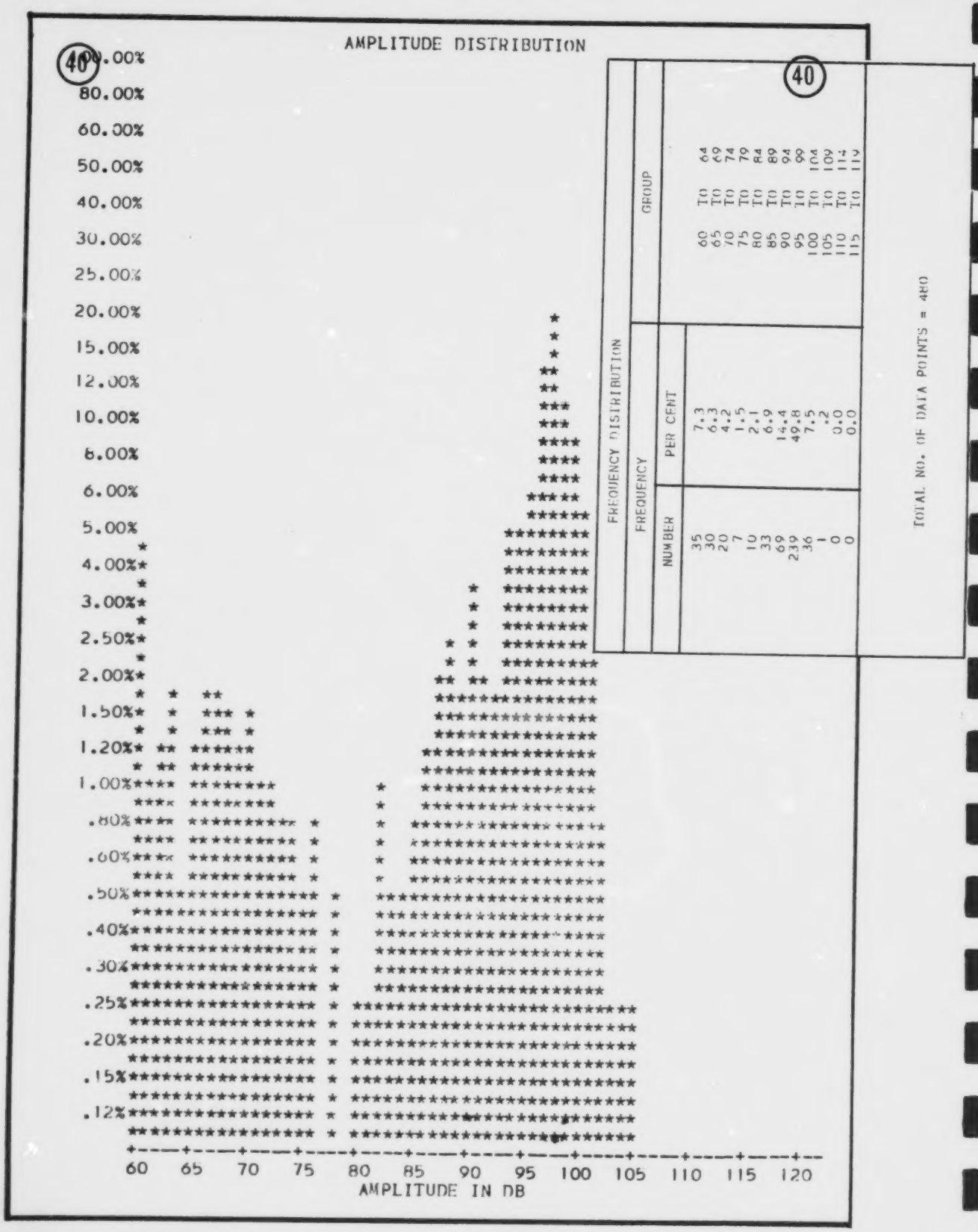
DATA ANALYZED : 19 SEPT 1979
    SITE CODE : 2SHAF
     JOB CODE : 212
    USER CODE : 4356
    THRESHOLD :  80 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =   0:43:53
```

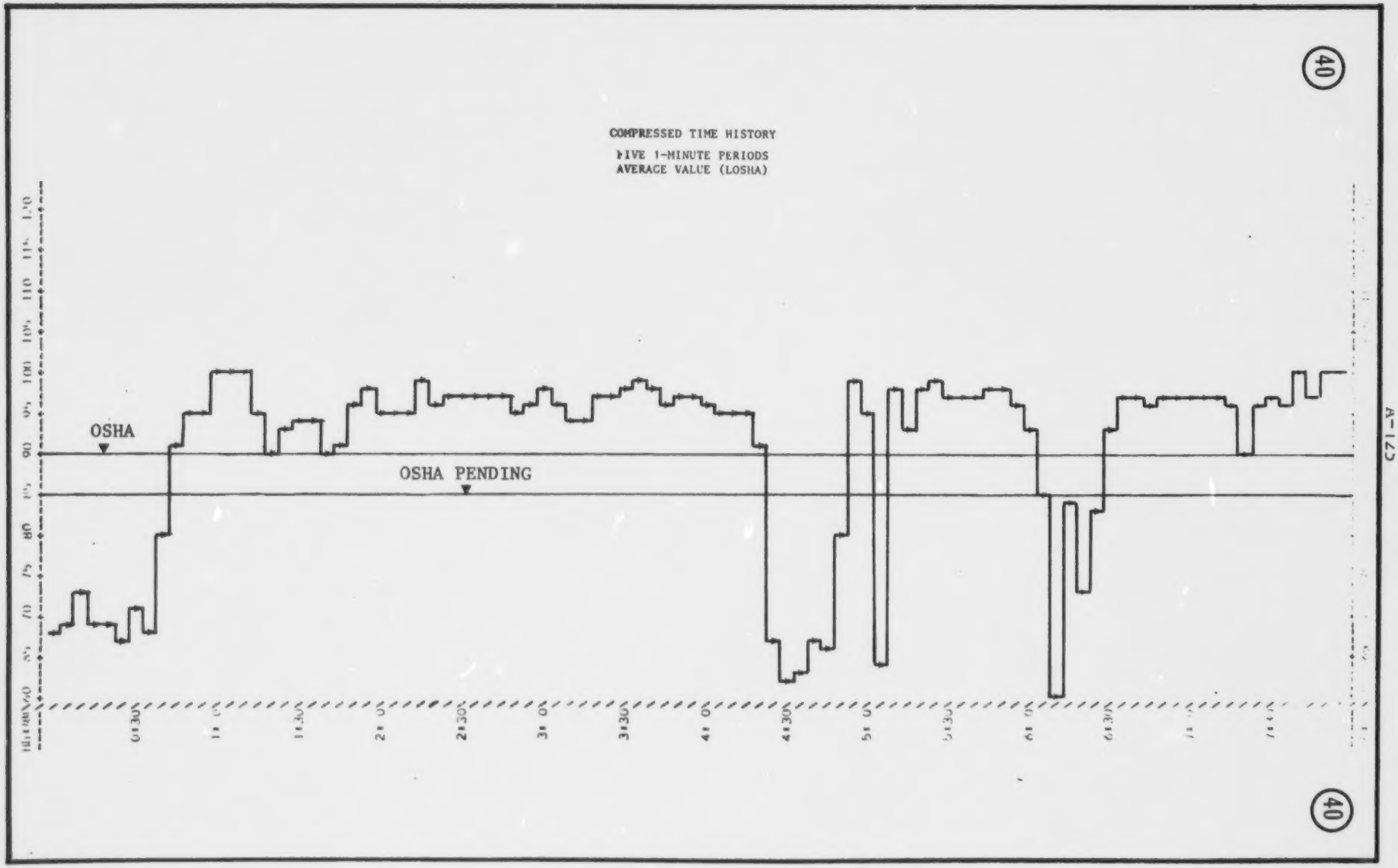
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		ZDOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	84.7	84.7	6.004	6.00
2	96.0	93.3	28.556	34.56
3	96.4	94.0	30.364	64.92
4	96.9	94.8	32.583	97.51
5	90.8	94.2	14.038	111.55
6	96.5	94.6	30.793	142.34
7	92.7	94.4	18.240	160.58
8	97.4	94.8	34.973	195.55

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 89 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB
MAX. COMP. = 105 DB


AMPLITUDE DISTRIBUTION
40
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 35 7.3
65 TO 69 30 6.3
70 TO 74 20 4.2
75 TO 79 7 1.5
80 TO 84 10 2.1
85 TO 89 33 6.9
90 TO 94 69 14.4
95 TO 99 239 49.8
100 TO 104 36 7.5
105 TO 109 1 .2
110 TO 114 0 0.0
115 TO 119 0 0.0
TOTAL NO. OF DATA POINTS = 480


40
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
40

82-144 M.U. Savich

Noise measurement on underground crushing equipment at Denison Mines Ltd. in Elliot Lake

1982

MESURE DU BRUIT DU MATÉRIEL DE CONCASSAGE SOUTERRAIN DE LA DENISON MINES LTD. À ELLIOT LAKE

M.U. Savich*

RÉSUMÉ

Trente-neuf mesures de l'indice d'exposition au bruit (IEB) ont été enregistrées pour des opérateurs de brise-roche, de "cherry pickers", de convoyeurs à bande pour grizzly et de concasseurs. Les résultats montrent que les niveaux de bruit dépassent les niveaux acceptables dans le cas des brise-roche et des "cherry pickers". Les opérateurs de convoyeurs à bande ne sont pas exposés à des niveaux de bruit dépassant les niveaux acceptables.

L'acceptabilité des instruments utilisés pour cette application reste douteuse étant donné le nombre élevé de niveaux de crête produits par la machinerie. Les normes ANSI actuelles tant pour les sonomètres que les dosimètres n'offrent aucune garantie d'exactitude lorsque des bruits impulsifs sont présents.

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*Chercheur scientifique, Laboratoire d'Elliot Lake, CANMET, Énergie, Mines et Ressources Canada, Elliot Lake (Ontario).

NOISE MEASUREMENT ON UNDERGROUND CRUSHING EQUIPMENT AT DENISON MINES LTD. IN ELLIOT LAKE

by

M.U. Savich*

ABSTRACT

Thirty nine measurements of the Noise Exposure Index (NEI) were recorded for operators of rock breakers, cherry pickers, grizzly belt conveyors and crushers. The results show that noise levels exceed acceptable levels at rock breakers and cherry pickers. Conveyor belt operators are not exposed to noise levels in excess of the acceptable levels.

The acceptability of instruments used for this application remains questionable due to the frequent number of peak levels generated by the machinery. The current ANSI standards for both sound level meters and dosimeters provide no assurance of accuracy when impulsive noises are present.

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* Research Scientist, Elliot Lake Laboratory, CANMET, Energy, Mines and Resources Canada, Elliot Lake, Ontario.

CONTENTS

	Page
ABSTRACT	i
INTRODUCTION	1
ROCK BREAKER, CHERRY PICKER AND GRIZZLY OPERATORS	1
CONVEYOR BELT OPERATOR	7
CRUSHER OPERATOR	7
CONCLUSIONS	11
REFERENCES	11
APPENDIX A	12

FIGURES

No.		
1.	Variation of unloading and breaking noise time for full shift. Major sources of noise: 1) Diesel powered equipment; 2) Unload; 3) Breakage; 4) Hydraulic system	5
2.	Method of calculating equivalent sound level and LOSHA	6
3.	Crusher operator histogram over the whole working period. Measurements were performed with Type 2 Sound Level Meter and stop-watch	8
4.	Crusher operator histogram over the whole working period. Measurements were performed with Type 1 Sound Level Meter and portable graphic recorder	9
5.	Evaluation equivalent sound level during load time (Sept. 12, 1979)	10

TABLES

1.	Results of LOSHA and time during work day	2
2.	Measurement of noise exposure index at breaker operator's ear.	6
3.	Equivalent continuous sound level and LOSHA at crusher	10

INTRODUCTION

Thirty nine measurements of the Noise Exposure Index (NEI) were recorded for operators of rock breakers, cherry pickers, grizzly belt conveyors and crushers (Appendices 1 to 39). The results show that noise levels exceed acceptable levels at rock breakers and cherry pickers (see Table 1). The acceptability of instruments used for this application remains questionable due to the frequent number of peak levels generated by the machinery. The current ANSI standards for both sound level meters and dosimeters provide no assurance of accuracy when impulsive noises are present (1).

ROCK BREAKER, CHERRY PICKER AND GRIZZLY OPERATORS

The most difficult situation for the determination of noise exposure index, using short measurements, occurs around the breaker operator. Different noise types are mixed in terms of time length, and in terms of noise level. Major sources of noise on breaker stations are:

1) Diesel powered equipmnet; teletram and scooptram
2) Unload
3) Breakage
4) Hydraulic system.

Noise exposure tests at the breaker operator's ear were conducted (see Fig. 1):

1) Duration of noise was measured using a stop-watch, and surveyor's eyes and ear.
2) Type 2 Sound Level Meter, B & K and stop-watch.

At the start of the shift, the productivity of the loading machines falls sharply when the rock is thrown further than 10 m from the face. It is necessary to gather up small volumes of rock, and this explains the low filling

Table 1 - Results of L_{OSHA} and time during work day

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
1	7710	284	Rockbreaker Op.	479	93.5	24	13	27	37	10	45	217	72	18	17	0	0	480	CC203
2	7661	213	Rockbreaker Op.	480	91.1	56	14	17	20	110	64	98	69	31	1	0	0	480	24ROB
3	4800	296	Rockbreaker Op.	480	94.2	95	26	18	17	23	34	102	89	65	10	1	0	480	20PAN
4	4441	273	Rockbreaker Op.	480	87.3	182	39	39	29	21	17	94	52	6	1	0	0	480	CC210
5*	4466	RBR	Rockbreaker Op.	480	75.7	390	24	13	13	13	3	12	11	1	0	0	0	480	34960
6	4103	RBO	Rockbreaker Op.	480	97.5	32	20	12	6	27	107	82	58	87	43	6	0	480	1SN23
7	4550	RBO	Rockbreaker Op.	480	88.1	155	67	41	42	43	41	38	23	24	4	2	0	480	00000
8	4262	271	Rockbreaker Op.	480	95.6	104	16	8	12	35	58	64	54	125	4	0	0	480	30950
9	4733	213	Rockbreaker Op.	480	83.7	262	30	16	14	20	65	49	18	6	0	0	0	480	00371
10*	4731	213	Rockbreaker Op.	480	76.8	181	82	81	53	47	17	16	3	0	0	0	0	480	1SHAF
11	4460	214	Rockbreaker Op.	480	86.5	49	12	16	39	197	89	42	31	5	0	0	0	480	1SHAF
12	4103	RBO	Rockbreaker Op.	480	91.7	44	21	10	6	54	166	71	70	36	2	0	0	480	1SHAF
13	4635	213	Rockbreaker Op.	480	88.1	285	33	17	8	21	30	25	32	17	12	0	0	480	1SHAF
14	4685	RBC	Rockbreaker Trn.	480	91.6	36	21	20	9	70	148	73	63	37	3	0	0	480	1SHAF
15	4386	281	Cherry Pkr. Op.	480	100.1	93	23	24	13	29	80	73	65	33	12	16	19	480	CC202
16	4068	270	Cherry Pkr. Op.	480	90.7	73	12	19	13	54	106	84	112	7	0	0	0	480	CC203
17	4116	281	Cherry Pkr. Op.	480	87.8	100	36	33	40	102	47	61	49	11	1	0	0	480	CC210
18	4068	270	Cherry Pkr. Op.	480	93.5	20	17	23	14	104	77	95	93	29	3	3	2	480	CC210
19	4116	281	Cherry Pkr. Op.	480	94.7	58	10	16	20	98	64	63	56	78	16	1	0	480	CC210
			Mean	479.94	93.50 ▲	98.12	24.12	20.94	19.94	59.88	72.82	78.29	59.18	36.18	7.59	1.71	1.24	480	
			Std. Dev.	0.24	Log aver.	79.57	14.12	9.38	12.54	48.77	40.53	42.02	24.98	33.79	10.78	4.01	4.6	480	
20	4523	241	Grizzly Operator	480	90	114	24	46	31	76	51	58	64	10	3	2	1	480	CC210
21	4523	241	Grizzly Operator	480	88.3	171	39	28	21	24	31	86	68	12	0	0	0	480	CC210
			Mean	480	89.23 ▲	142.5	31.5	37	26	50	41	72	66	11	1.5	1	0.5	480	
			Std. Dev.	-	Log aver.	40.31	10.61	12.73	7.07	36.77	14.14	19.80	2.83	1.41	2.12	1.41	0.71	480	

* Not estimated

Cont. overleaf

Table 1 - cont.

No.	User Code	Job Code	Operation	Time (min)	LOSHA (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
22	7919	CDO	Conveyor Belt Op.	480	87.7	200	67	27	25	21	23	41	55	19	2	0	0	480	1SH23
23	4078	CBO	Conveyor Belt Op.	480	67.5	379	37	35	15	7	5	2	0	0	0	0	0	480	1SH23
24	4605	230	Conveyor Belt Op.	480	86.3	243	26	22	11	28	26	52	72	0	0	0	0	480	00344
25	4605	230	Conveyor Belt Op.	480	76.7	388	18	9	12	9	14	17	13	0	0	0	0	480	00344
26	4609	230	Conveyor Belt Op.	480	84.9	125	46	41	37	133	31	23	37	7	0	0	0	480	00347
27	4527	230	Conveyor Belt Op.	480	84.2	213	25	26	20	102	24	22	46	2	0	0	0	480	00347
28	4830	230	Conveyor Belt Op.	480	88.6	246	54	23	14	6	12	19	70	35	1	0	0	480	00348
29	4531	230	Conveyor Belt Op.	480	88.2	138	56	42	27	27	26	84	73	5	2	0	0	480	00348
30	4267	230	Conveyor Belt Op.	480	86.3	145	43	48	13	11	84	98	38	0	0	0	0	480	00350
31	4621	230	Conveyor Belt Op.	480	87.9	84	28	36	45	41	58	147	41	0	0	0	0	480	00351
32	4710	241	Conveyor Belt Op.	480	97.4	111	23	13	25	48	120	44	34	6	7	47	2	480	120BE
33	7483	CON	Conveyor Belt Op.	480	80.1	304	20	11	12	21	71	39	2	0	0	0	0	480	00000
34	4222	CBO	Conveyor Belt Op.	480	84.8	190	47	41	47	76	17	35	22	0	1	4	0	480	00000
35	4077	CBO	Conveyor Belt Op.	480	77.4	299	54	32	25	19	25	18	6	2	0	0	0	480	00000
36	7919	CBO	Conveyor Belt Op.	480	83.4	170	57	43	43	50	53	39	23	2	0	0	0	480	00000
37	0816	132	Conveyor Belt Op.	480	77.6	255	52	54	39	28	29	16	7	0	0	0	0	480	00000
			Mean	480	88.09	218.13	40.81	31.44	25.63	39.19	38.63	43.50	33.69	4.88	0.81	3.19	0.13	480	
			Std. Dev.	-	▲ Log aver	91.21	15.58	13.46	12.83	36.16	30.92	37.26	24.92	9.41	1.8	11.73	0.5	480.03	
38*	4375	132	Crusher Operator	126	91.8	425	11	3	3	6	1	4	4	20	3	0	0	480	12950
39	0660	067	Crusher Operator	480	97.6	36	45	33	15	22	45	41	69	139	35	0	0	480	UCRUS
			Mean	480	97.6	36	45	33	15	22	45	41	69	139	35	-	-	480	
			Std. Dev.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	480	

* Not estimated

factor of the teletram and scooptram. Small volumes of rock pass through the grill, while being unloaded, thus making breaking time very short. The noise duration, during one unloading and breaking cycle is dependent on quantity and size of ore.

Date from unloading and breaking times were computerized, and the slope lines had approximately the same angle: $9.8° \approx 11.7°$ (graphical determination). This shows that both tests are good because their respective results were similar.

Average unloading and breaking time was higher by 20 seconds when observations were taken with the eyes, ear, and stop-watch. Arithmetic means are:

Ear + Stop-watch (Mean - 189.5s, St. dev. - 67.8s) > Sound Level Meter + Stop-watch (Mean - 169.6s, St. dev. - 67.8s)

In both cases it is essential that noise is not distributed equally during a full shift. The surveyor determining the noise exposure index, using short measurements, could make an error in time measurements of 72 to 228 seconds (see Fig. 1), a difference of 2.6 minutes. If there are 30 cycles/shift, the answer will be off by 78 minutes, which is catastrophic in evaluating the noise exposure index. This is why a detailed analysis of this situation must be carried out.

The similarity of current measurements (Table 1), to those previously recorded (Table 2) is shown in Fig. 2. Differences in L_{eq} (load) reading results still exist.

The method of measuring noise exposure index using these instruments remains open to question. It would be possible to perform these measurements using expensive and complex electronic instruments and high speed photographic techniques. These measurements would have theoretical and practical value for the study of impulse noise in mines.

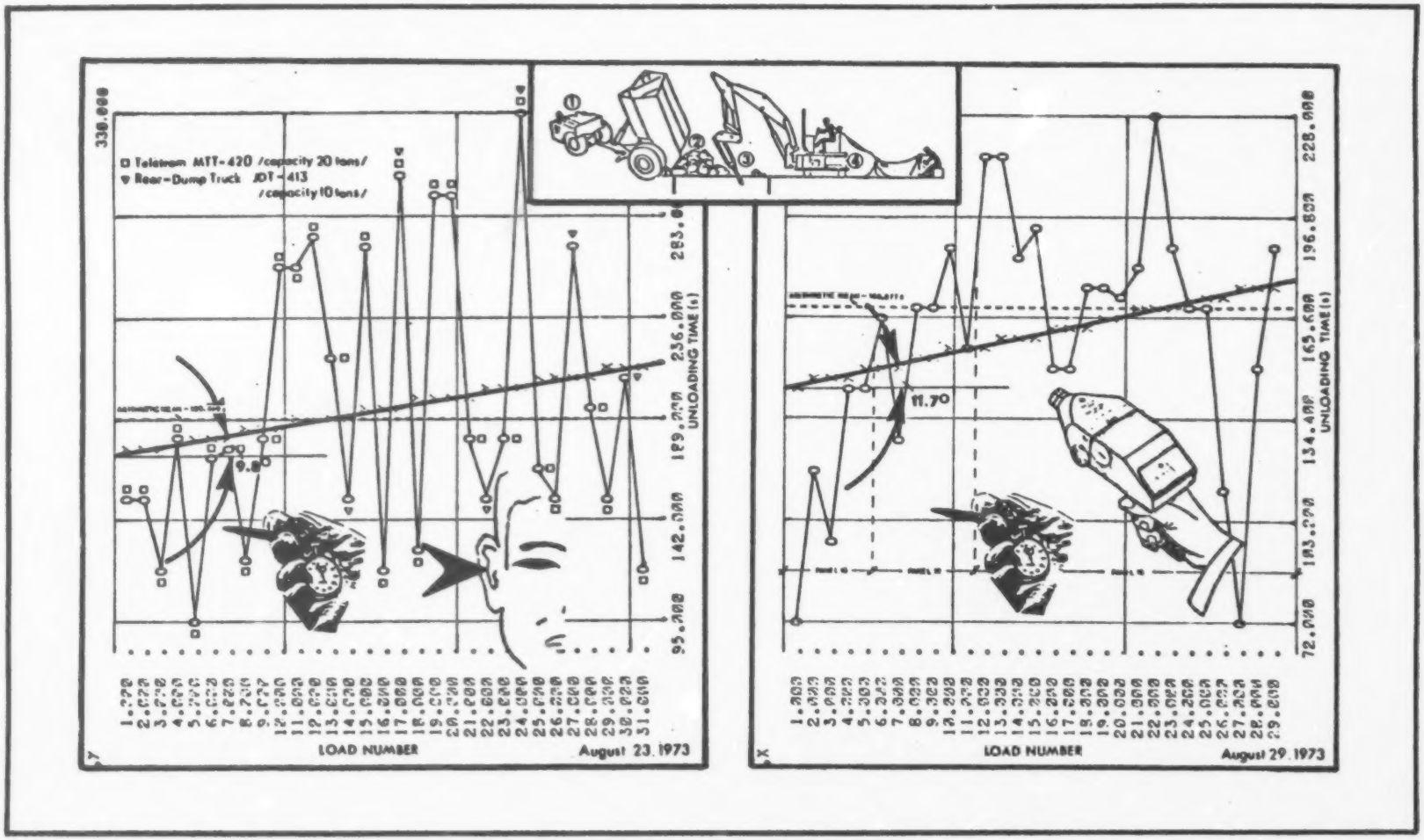


Fig. 1 - Variation of unloading and breaking noise time for full shift. Major sources of noise: 1) Diesel powered equipment; 2) Unload; 3) Breakage; 4) Hydraulic system.

Table 2 - Measurement of noise exposure index at breaker operator's ear

Date	Sound Level Meter Type 2205, B & K			166 Environmental Noise Classifier B&K			Sound Dosimeter Bendix		
	NEI*	Time (h)	Leq (load)	NEI	Time (h)	Leq (load)	NEI	Time+ (h)	Leq (load)
23/08/73	(1.03)	1.63	(101.8)	1.17	1.41	103.4	1.07	1.41	103.7
29/08/73	0.86	1.37	101.8	1.17	1.32	104.2	1.15	1.32	104.8

* NEI - Noise Exposure Index
\+ Time from 166 Noise Classifier
( ) Estimated from data 29/08/1973.

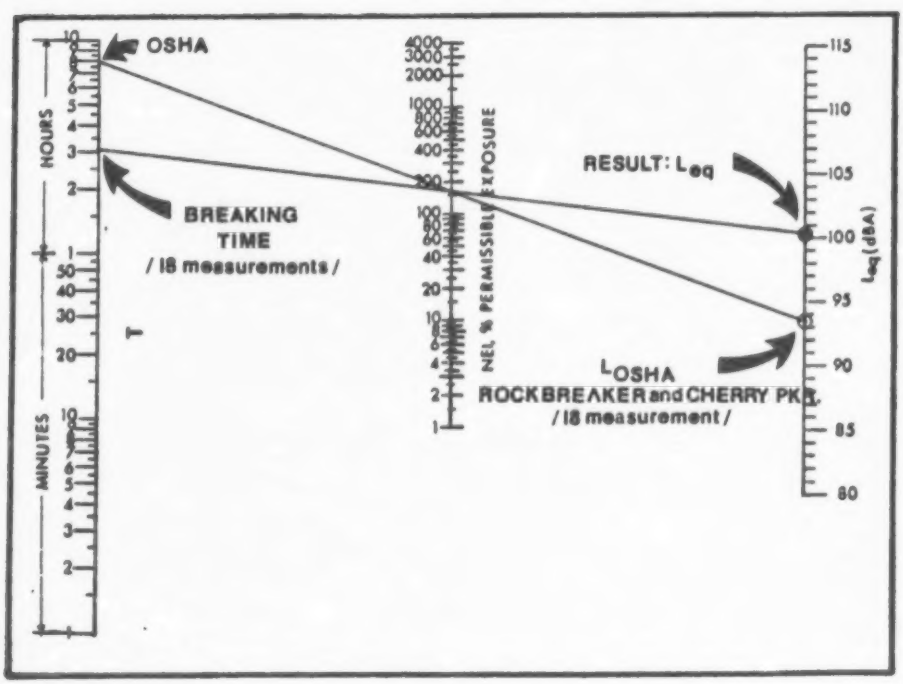


Fig. 2 - Method of calculating equivalent sound level and L_{OSHA}.

CONVEYOR BELT OPERATOR

It was concluded that the noise level is within permissible levels for the conveyor belt operator based on 16 measurements. Higher noise levels were recorded in the area of the crusher rock breakers or at the unload end of the belt. The operator spends very little time in these areas over a shift.

CRUSHER OPERATOR

Three measurements were performed on the crusher operator: 1973 using Type 2 sound level meter and stop-watch (see Fig. 3); 1977 using Type 1 sound level meter (see Fig. 4) and portable graphic recorder; and 1979 with a profiling dosimeter. In the first case the accuracy of the measurements, and evaluation of results are dependent on the surveyor, in the second the evaluation is only of the surveyor. In the third instance the measurement and evaluation are completed electronically and completely independent of the surveyor. It may be seen from Table 3 that the results of L_{eq} are very similar.

Evaluation of L_{OSHA} was performed with the graphical method (see Fig. 5) (2).

The results show that is unnecessary to perform supplementary measurements as accurate results may be realized by measuring the duration of the load time only, on the basis of production, electrical power consumption or similar methods. As with rock crushers it would be necessary to perform the measurements with complex acoustical instruments.

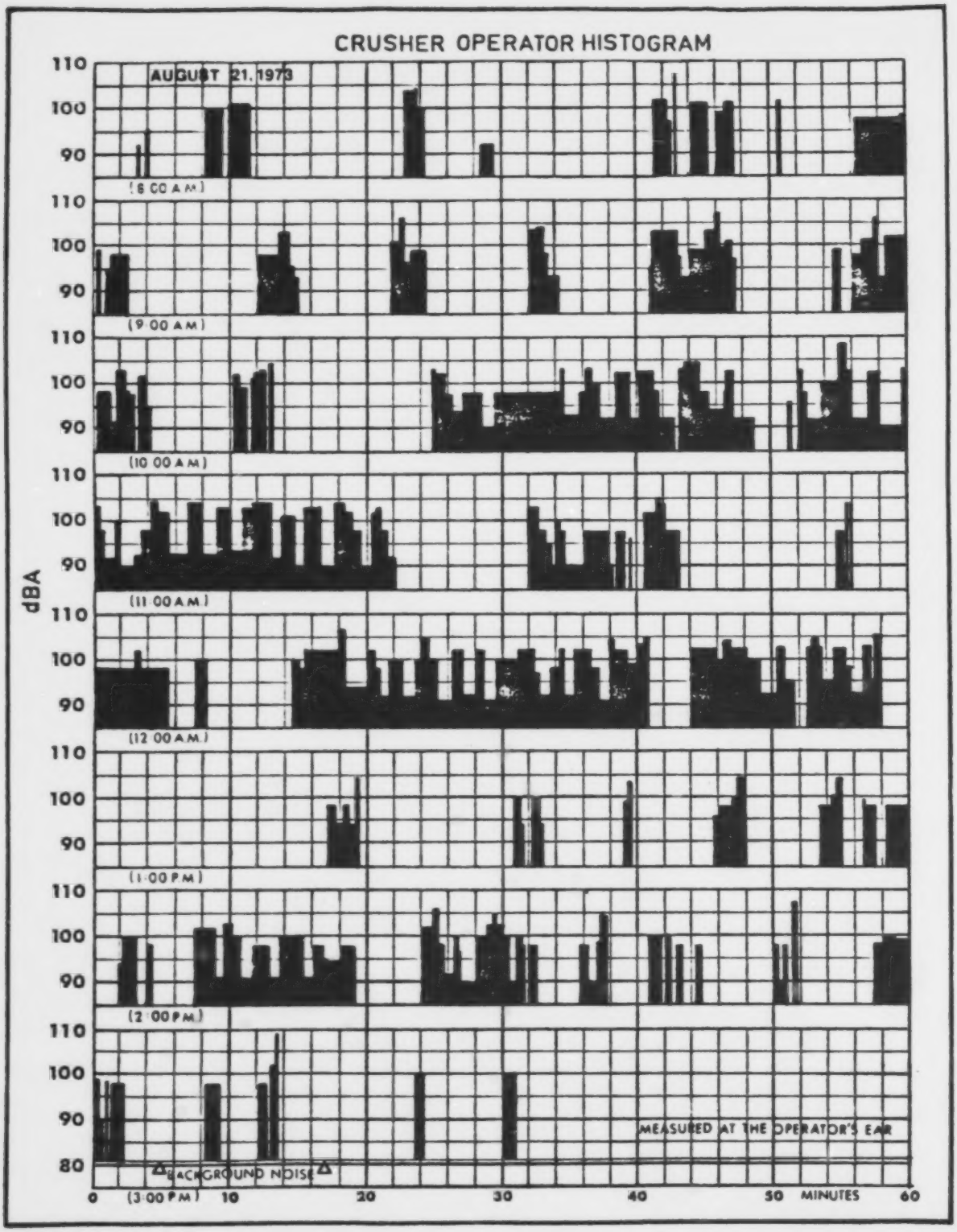
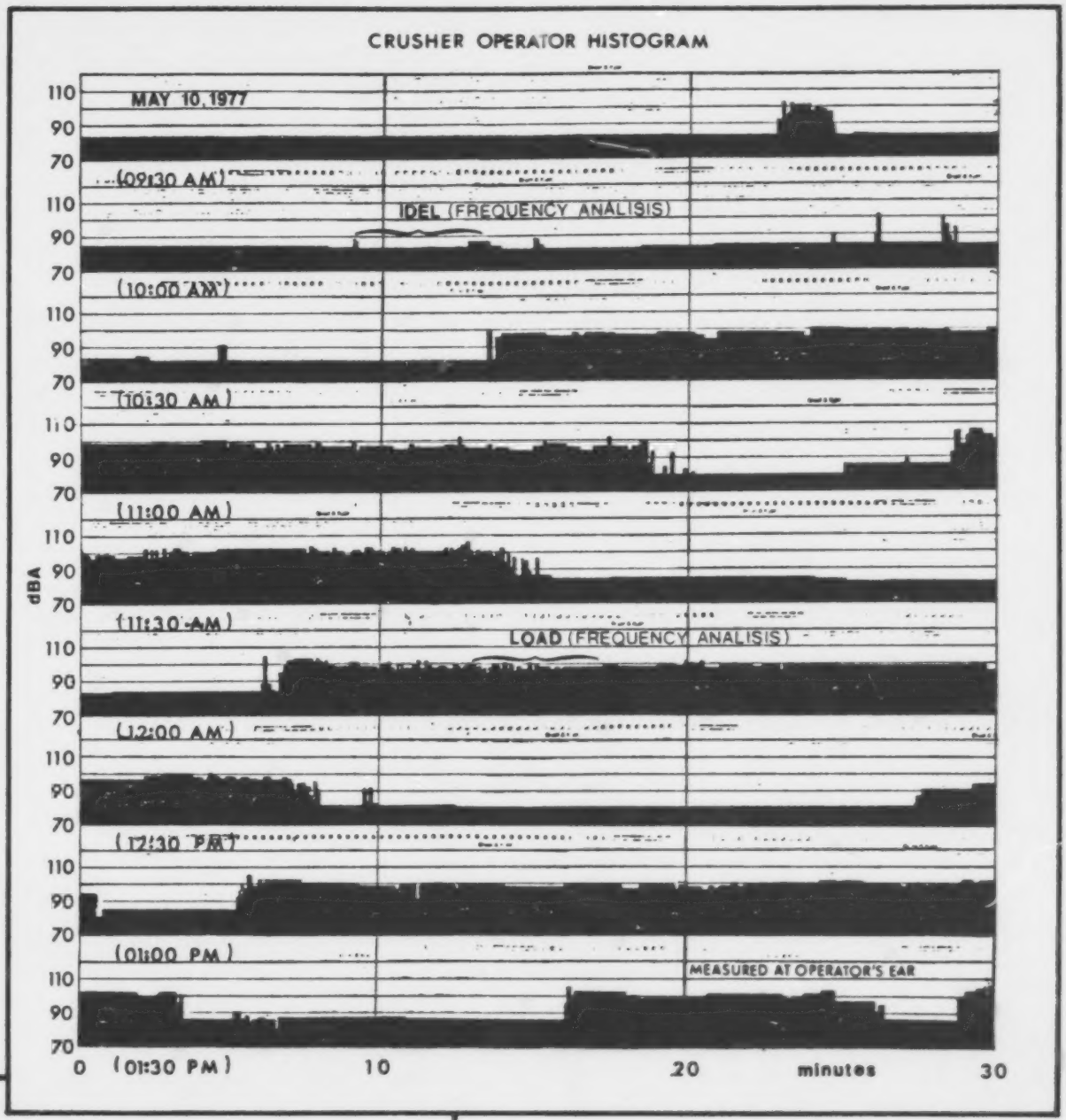


Fig. 3 - Crusher operator histogram over the whole working period. Measurements were performed with Type 2 Sound Level Meter and stop-watch.



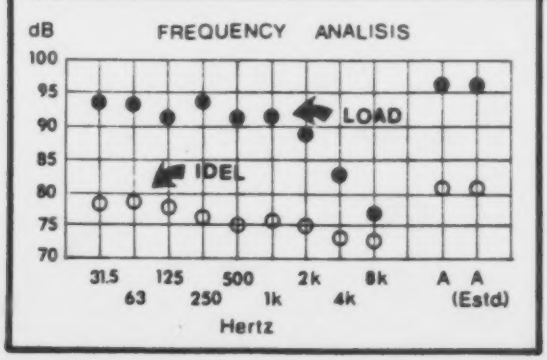


Fig. 4 - Crusher operator histogram over the whole working period. Measurements were performed with Type 1 Sound Level Meter and portable graphic recorder.

Table 3 - Equivalent continuous sound level and L_{OSHA} at crusher

Date	Measurement at Operator's Ear		
	L_{eq}*	L_{OSHA}	Instrument
21/08/73	100.3	93.5	Type 2 Sound Level Meter (B&K) and stop-watch
10/05/77	100.2	91.2	Type 1 Sound Level Meter and Portable Graphic Recorder (B&K)
12/09/79	101.5	97.6	Profiling dosimeter (301-Metrologer, Metrosonics)

Note: * during load time

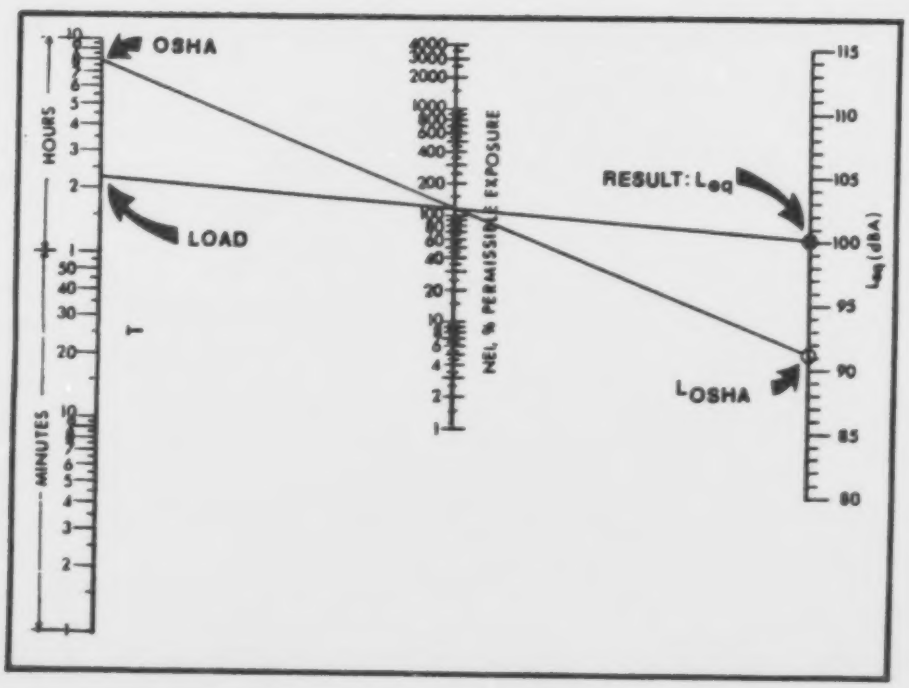


Fig. 5 - Evaluation equivalent sound level during load time (Sept. 12, 1979).

CONCLUSIONS

The measurement of NEI of operators of rock breakers and cherry pickers, grizzlies, and crushers has great theoretical value in the future determination of exposures. The peak noise level and the number of occurrences during a shift remain undetermined.

Conveyor belt operators are not exposed to noise levels in excess of the acceptable levels.

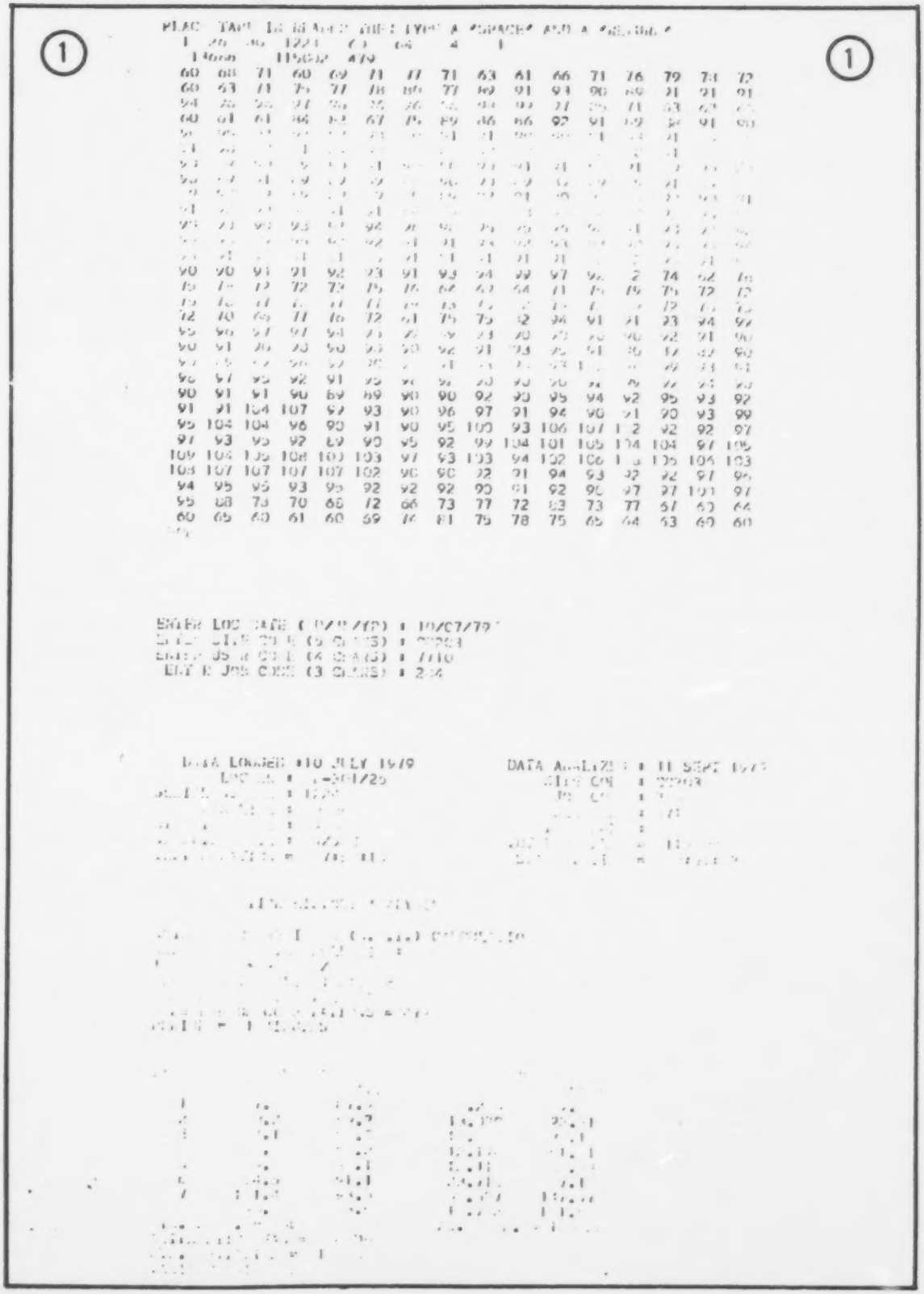
REFERENCES

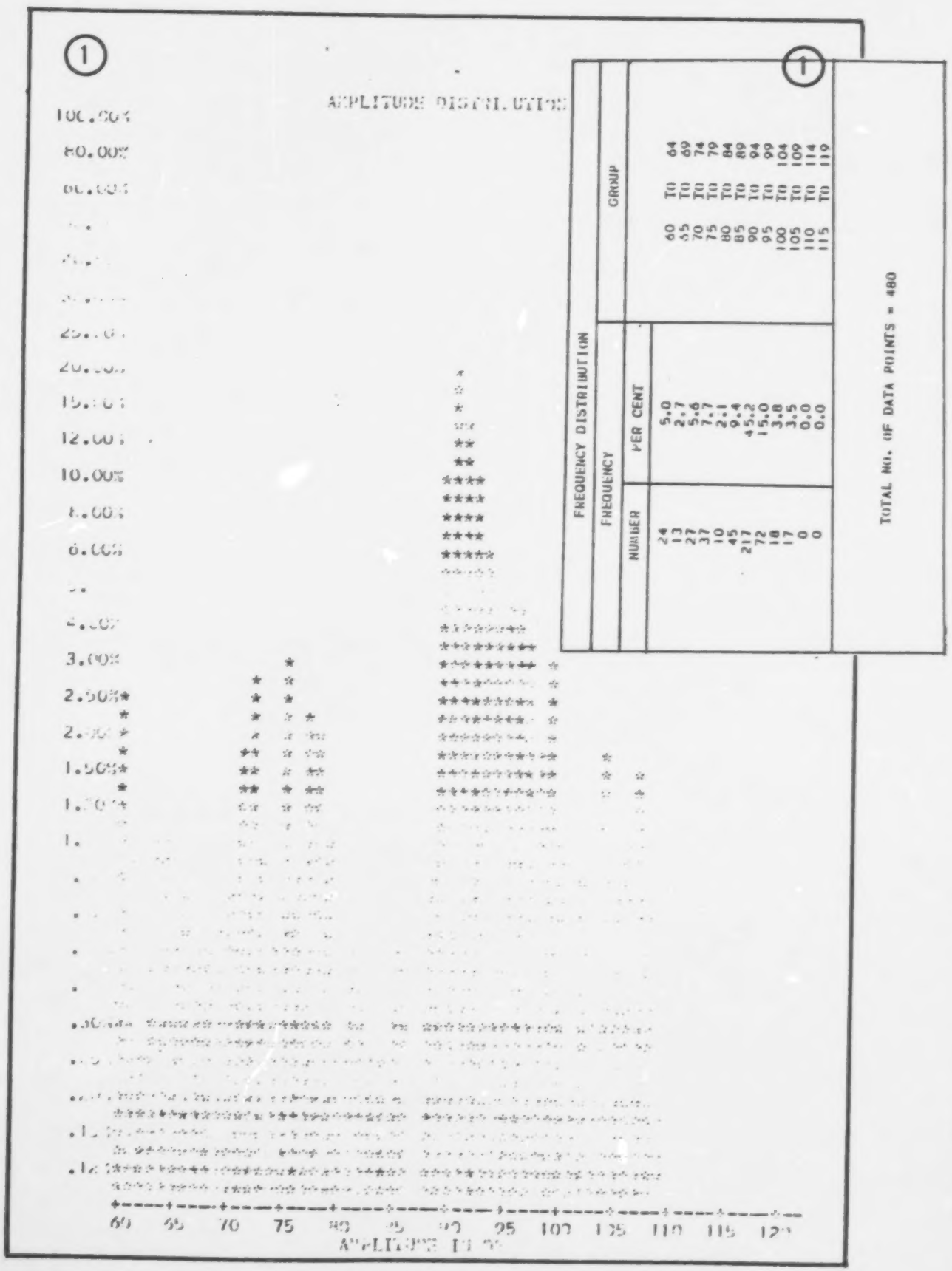
1. Kundert, W.R., "Dosimeters, impulsive noise and the OSHA hearing conservation amendment"; Noise Control Engineering J, vol 19, no. 3, 1982.

2. Savich, M., "Simple graphical method of evaluation of the noise exposure index and the equivalent continuous sound level"; Can Min and Met Bull, Sept. 1978.

APPENDIX A

MEASUREMENT OF NOISE EXPOSURE INDEX ON UNDERGROUND CRUSHING EQUIPMENT WITH FULL INFORMATION: LOSHA (CURRENT AND CUMULATIVE); PERCENT DOSE (CURRENT AND CUMULATIVE); ARITHMETIC MEAN; STANDARD DEVIATION; VARIANCE; AMPLITUDE DISTRIBUTION (GRAPHICAL AND NUMERICAL); AND TIME HISTORY (GRAPHICAL).

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100.00%
80.00%
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
60 TO 64
65 TO 69
70 TO 74
75 TO 79
80 TO 84
85 TO 89
90 TO 94
95 TO 99
100 TO 104
105 TO 109
110 TO 114
115 TO 119
24 5.0
13 2.7
27 5.6
37 7.7
10 2.1
45 9.4
217 45.2
72 15.0
18 3.8
17 3.5
0 0.0
0 0.0
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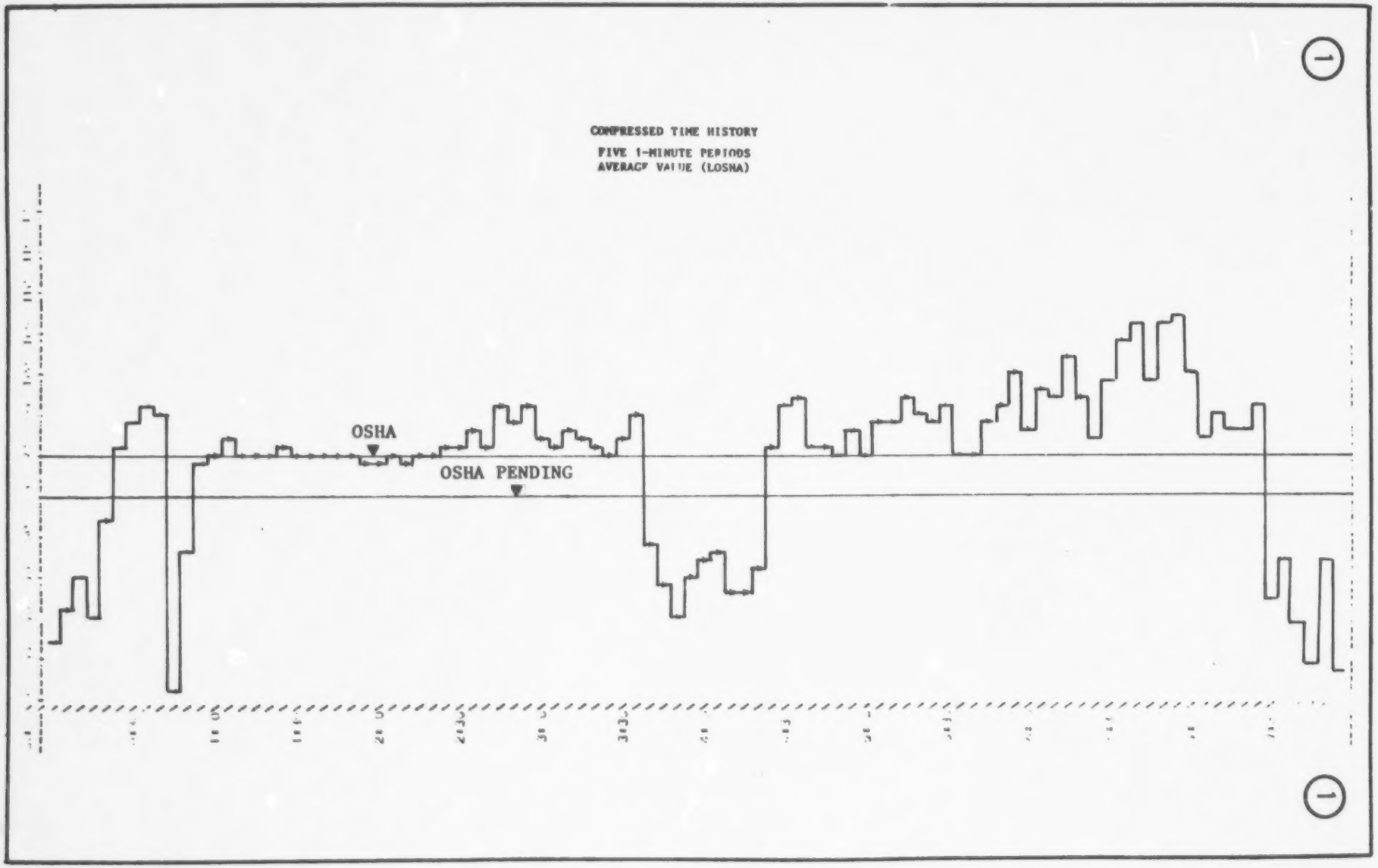
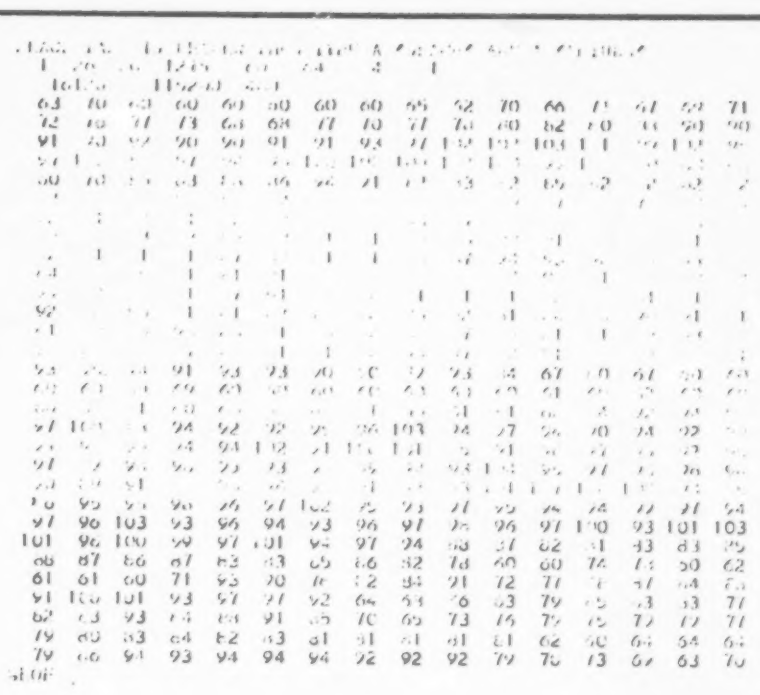
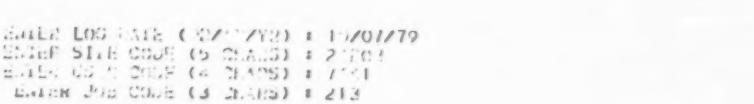
AMPLITUDE

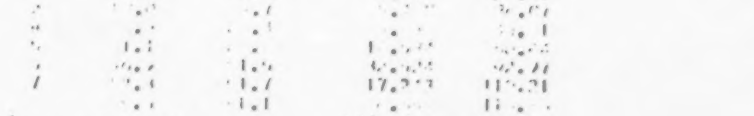

COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(2)

(2)



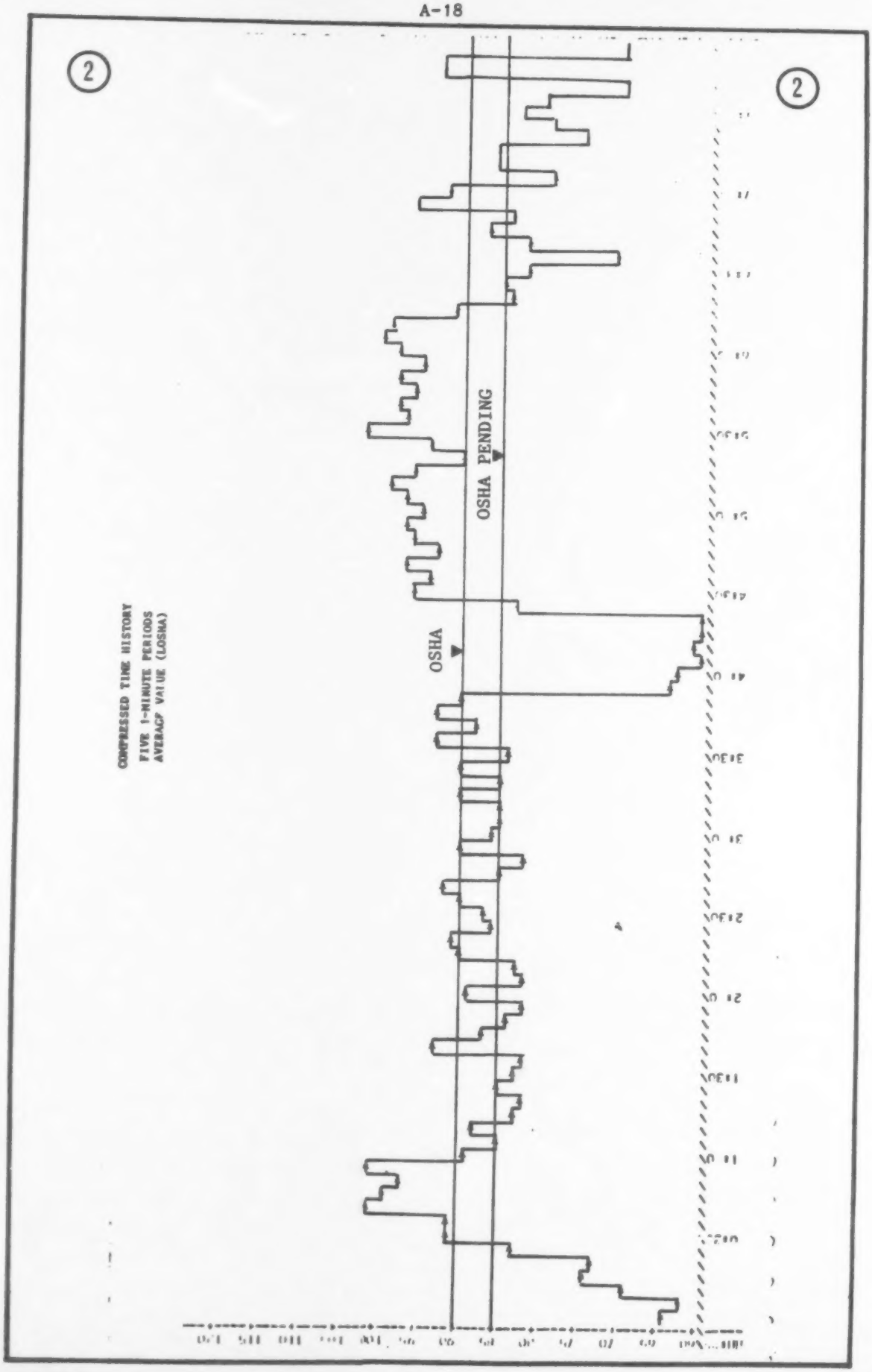




(2)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
56	11.7	60 TO 64
14	2.9	65 TO 69
17	3.5	70 TO 74
20	4.2	75 TO 79
110	22.9	80 TO 84
64	13.3	85 TO 89
98	20.4	90 TO 94
69	14.4	95 TO 99
31	6.5	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

(2)


2
2
OSHA PENDING
OSHA
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

③

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READ ... 1 ... 80 1225 ... 64 4 1
 10/7/79 11:20:00 480
 60 61 63 60 64 60 61 61 61 60 61 64 65 64 64 69
 65 76 71 67 64 74 67 71 63 62 67 69 72 74 78 80
 77 86 90 92 91 91 91 93 91 91 92 92 94 100 103 101
101 97 103 100 93 99 95 97 93 83 90 99 ... 96 101 100
101 92 92 92 93 ... 98 94 95 95 102 92 ... 96 ... 64
102 101 94 99 94 97 99 90 ... 90 91 93 ... 102 ... ...
... ... ... ... ... ... ... ... ... ... ... ... ... ...
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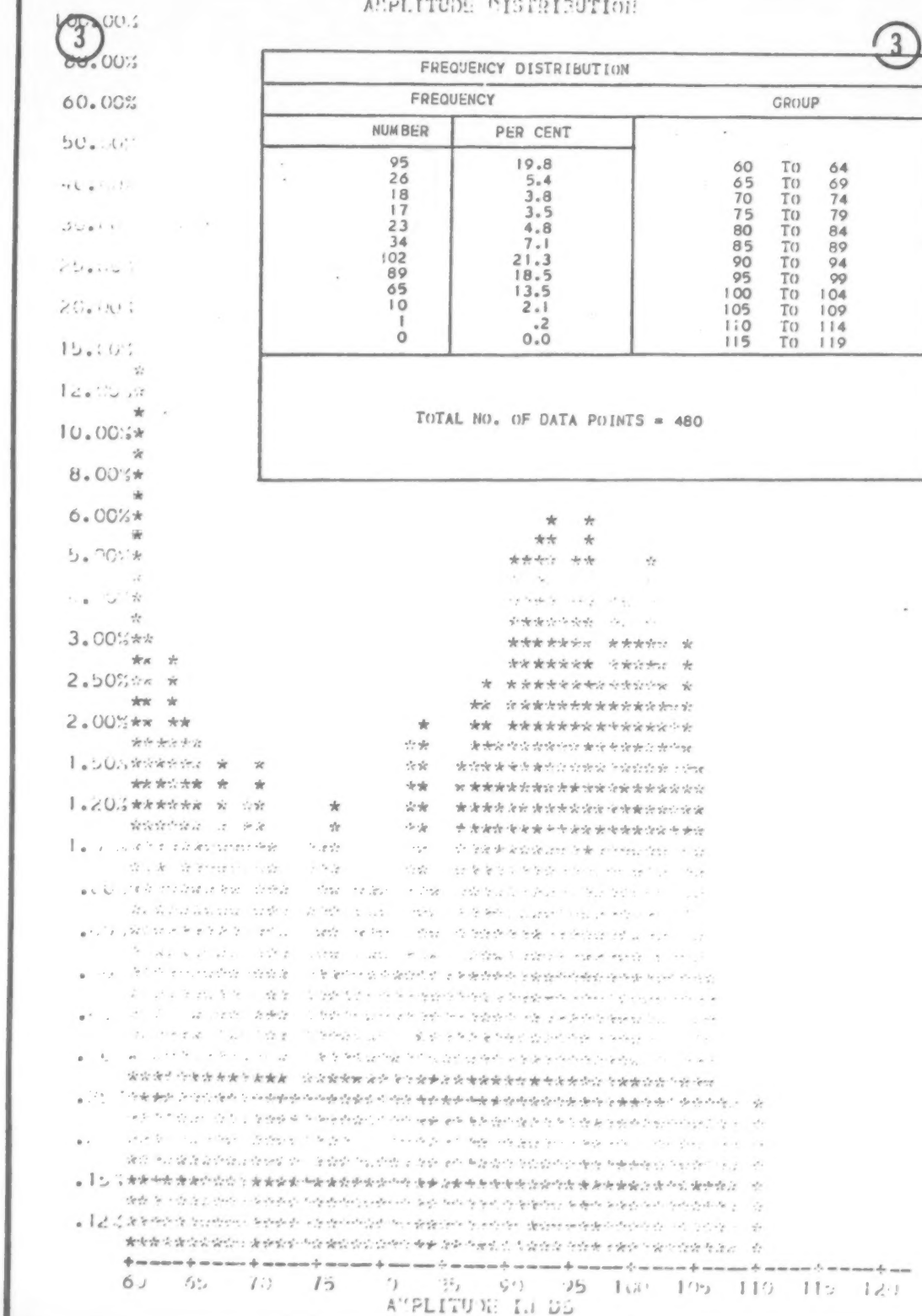
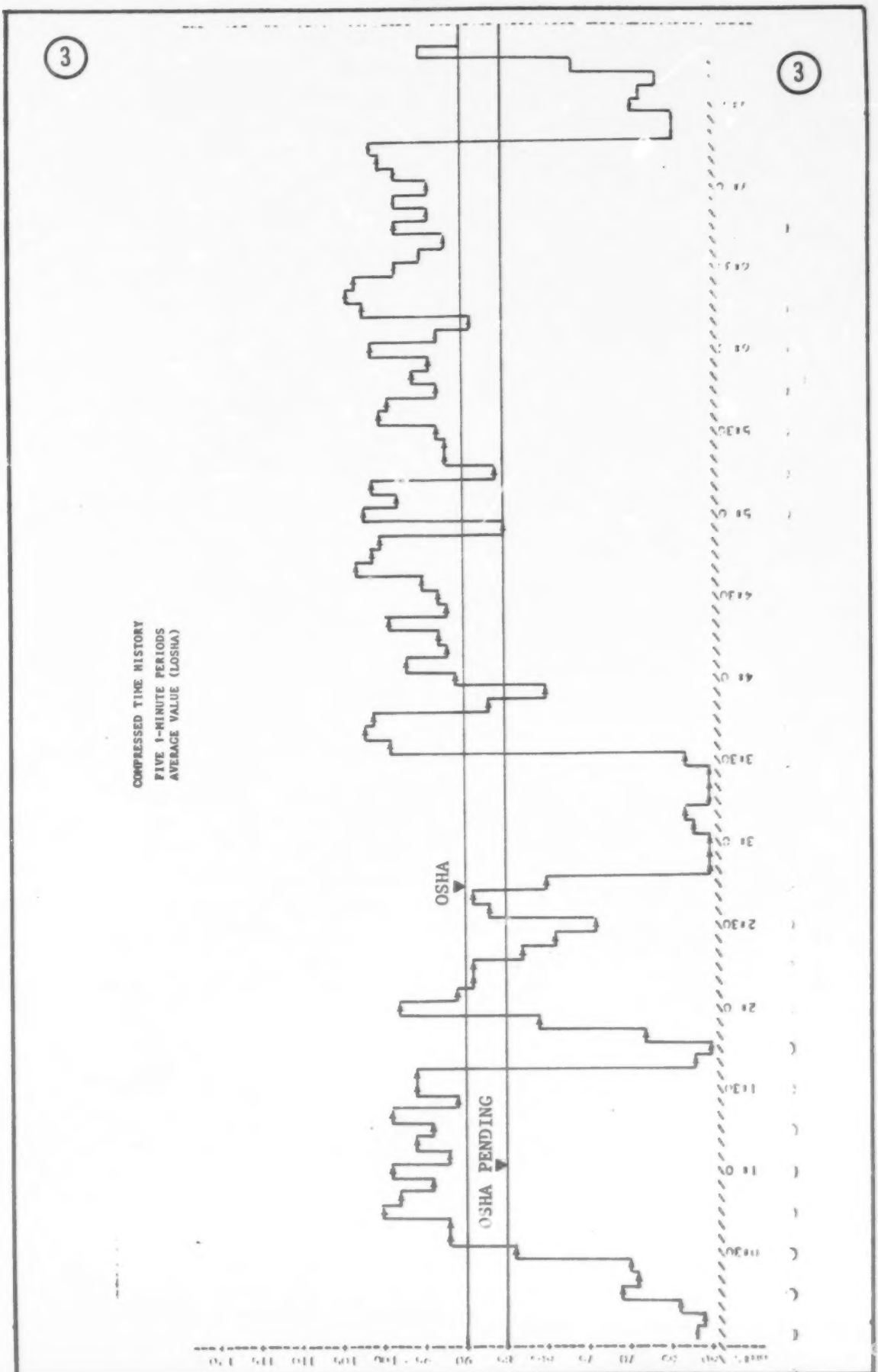
AMPLITUDE DISTRIBUTION

(3)

(3)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
95	19.8	60 To 64
26	5.4	65 To 69
18	3.8	70 To 74
17	3.5	75 To 79
23	4.8	80 To 84
34	7.1	85 To 89
102	21.3	90 To 94
89	18.5	95 To 99
65	13.5	100 To 104
10	2.1	105 To 109
1	.2	110 To 114
0	0.0	115 To 119
TOTAL NO. OF DATA POINTS = 480		




3
3
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(4)

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     89      115200   480
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%EOF
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(4)

ENTER LOG DATE (DD/MM/YR) : 13/07/79

ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4441
ENTER JOB CODE (3 CHARS) : 273

DATA LOGGED : 13 JULY 1979	DATA ANALYZED : 12 SEPT 1979
LOGGER : DB-301/26	SITE CODE : CC210
SERIAL NUMBER : 1218	JOB CODE : 273
BASELINE : 60 DB	USER CODE : 4441
DYNAMIC RANGE : 64 DB	THRESHOLD : 80 DB
SAMPLING RATE : 4/SEC	TOTAL SAMPLES = 115200
TEST DURATION = 8: 0: 0	STANDBY TIME = 0: 0:22

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOSHA		NOISE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.3	86.3	7.463	7.46
2	87.5	86.9	8.787	16.25
3	88.4	87.4	9.952	26.20
4	81.8	86.4	4.033	30.24
5	86.1	86.3	7.291	37.53
6	81.8	85.7	4.037	41.56
7	91.7	87.0	15.905	57.47
8	89.3	87.3	11.345	68.81

MIN. COMP. = 80 DB
ARITHMETIC MEAN = 75 DB
STD. DEVIATION = 15 DB
VARIANCE = 229 DB
MAX. COMP. = 106 DB

AMPLITUDE DISTRIBUTION

(4) (4)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
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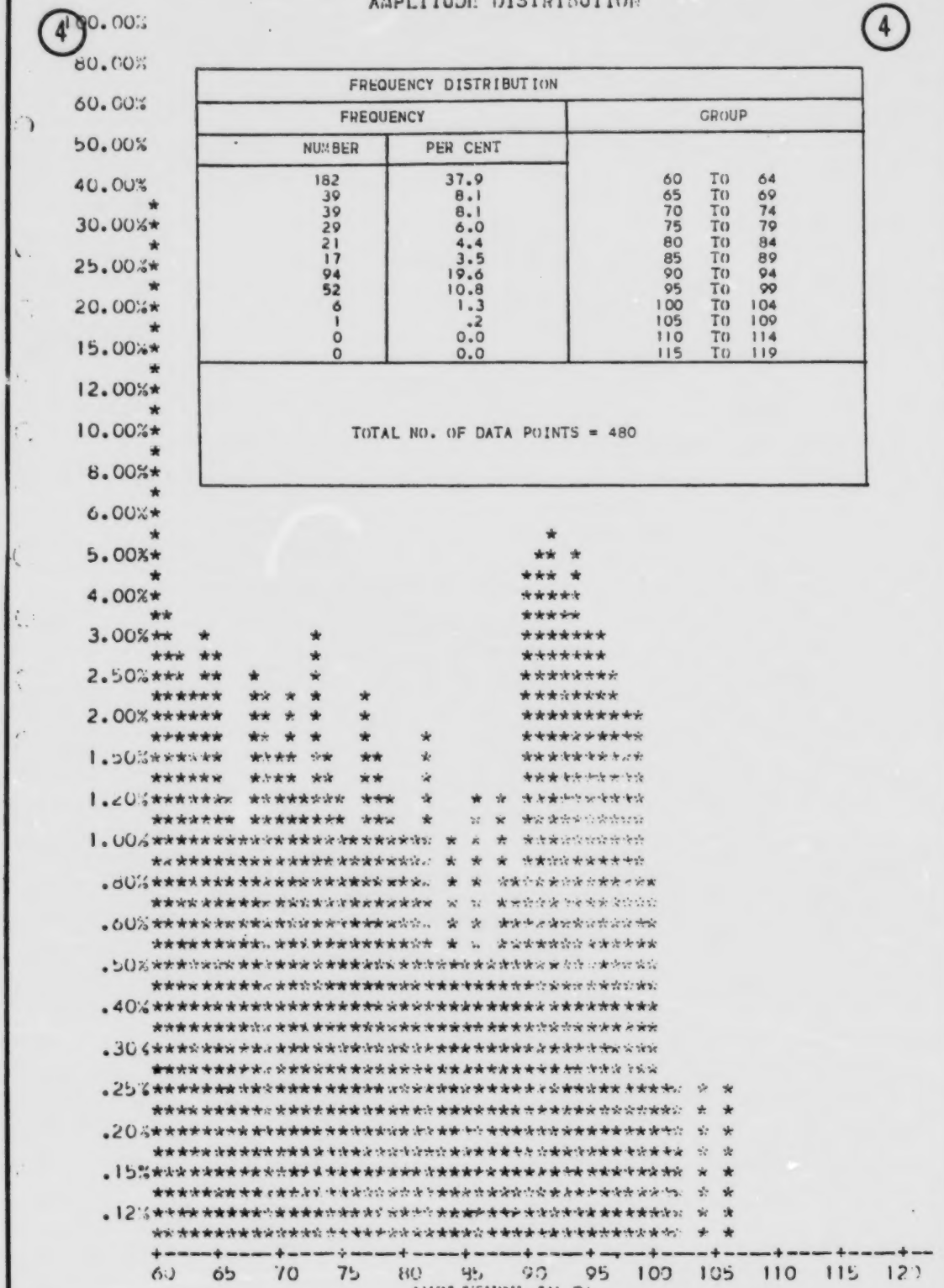
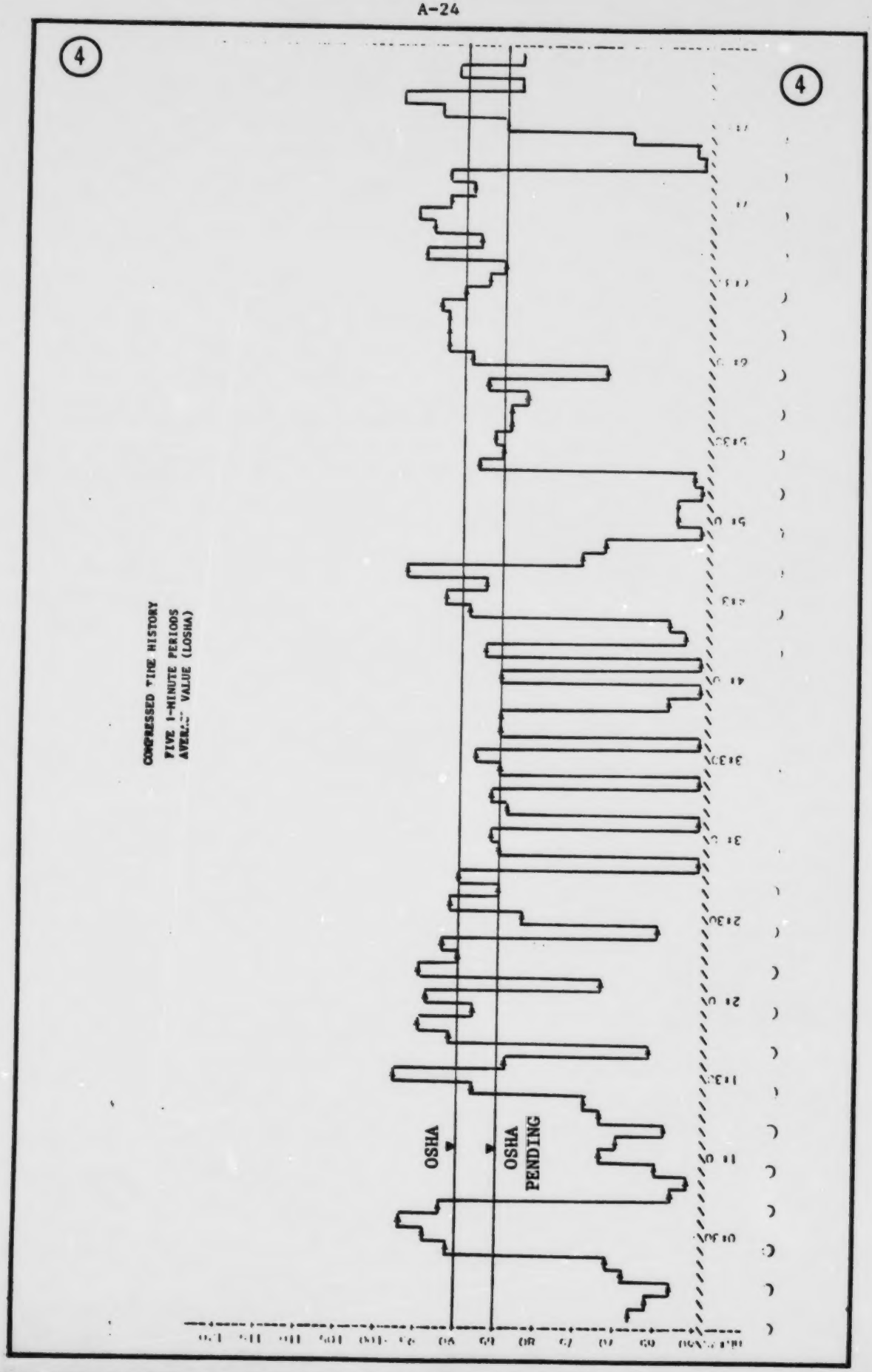
39	8.1	65 TO 69
39	8.1	70 TO 74
29	6.0	75 TO 79
21	4.4	80 TO 84
17	3.5	85 TO 89
94	19.6	90 TO 94
52	10.8	95 TO 99
6	1.3	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




4
4
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(5)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1224   60   64    4    1
     96      115200  480
  60  60  61  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  61  64  60  63  60  60  60  60  60  64  68  66  66  81
  91  73  80  75  81  96  99  87  84  83  86  82  97  99  97  94
  94  91  93  98 100  83  67  74  64  72  68  69  76  66  60  70
  65  60  60  60  67  63  60  60  62  62  60  62  60  60  60  60
  61  62  60  61  61  60  60  66  60  62  60  60  60  60  60  61
  62  60  71  76  77  62  60  60  60  60  60  60  70  98  96  71
  66  76  61  81  77  77  73  65  75  91  73  78  95  91  82  69
  79  75  60  60  60  60  60  67  61  60  60  60  60  65  63  68
  71  64  63  66  60  60  60  71  63  60  60  60  61  60  60  60
  60  60  60  60  60  60  60  61  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  62  60  60  60  64  60  60
  67  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  64  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  67  60  60
  60  60  60  60  60  63  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  77  63  60  60  60  60  60
  65  60  61  61  60  60  60  60  60  60  60  71  62  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  62  60  60  60  60  60  60
  60  60  60  60  60  66  60  60  72  81  80  62  65  60  62  60
  60  60  63  60  60  60  60  61  60  62  60  62  61  62  65  63
  62  60  63  60  60  72  60  79  83  93  95  91  94  92  96  92
%EOF
```

(5)

```
ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 34960
ENTER USER CODE (4 CHARS) : 4466

 ENTER JOB CODE (3 CHARS) : RBR
```

```
   DATA LOGGED :14  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/26               SITE CODE : 34960
 SERIAL NUMBER : 1224                     JOB CODE : RBR
      BASELINE : 60 DB                    USER CODE : 4466
 DYNAMIC RANGE : 64 DB                    THRESHOLD : 60 DB
 SAMPLING RATE :  4/SEC            TOTAL SAMPLES =  115200
 TEST DURATION =   0: 0: 0          STANDBY TIME =   0: 0:24
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100 DB = 30 DB / 8 HR
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		LOGA	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	65.9	65.9	7.077	7.08
2	76.3	72.6	1.877	8.95
3	72.9	73.6	1.165	10.12
4	60.4	70.6	.204	10.32
5	60.3	77.2	.205	10.53
6	61.6	76.0	.245	10.77
7	60.0	75.0	.195	10.97
8	79.2	75.7	2.810	13.78

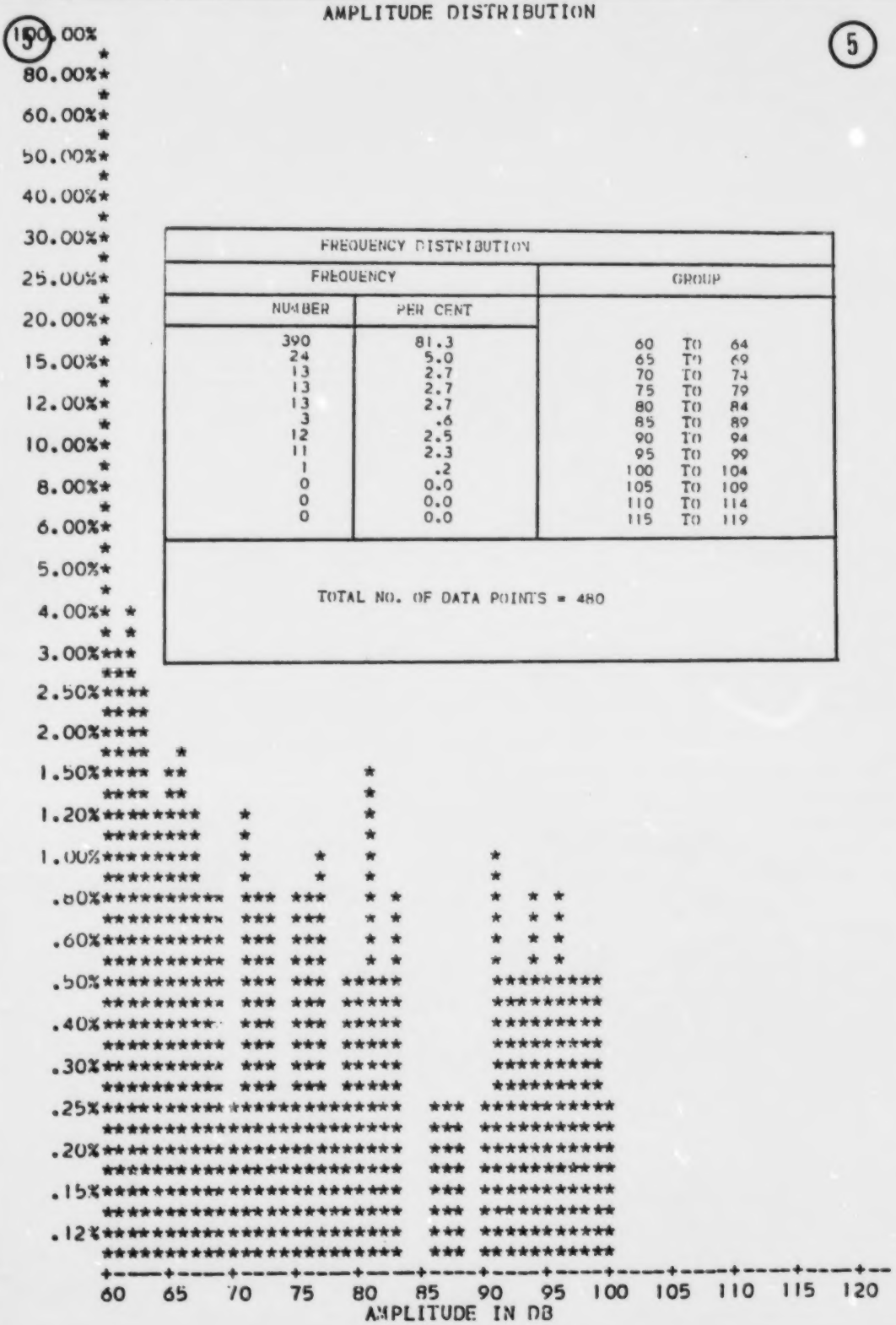
MIN. COMP. = 60 DB MAX. COMP. = 100 DB
ARITHMETIC MEAN = 63 DB
STD. DEVIATION = 9 DB
VARIANCE = 81 DB

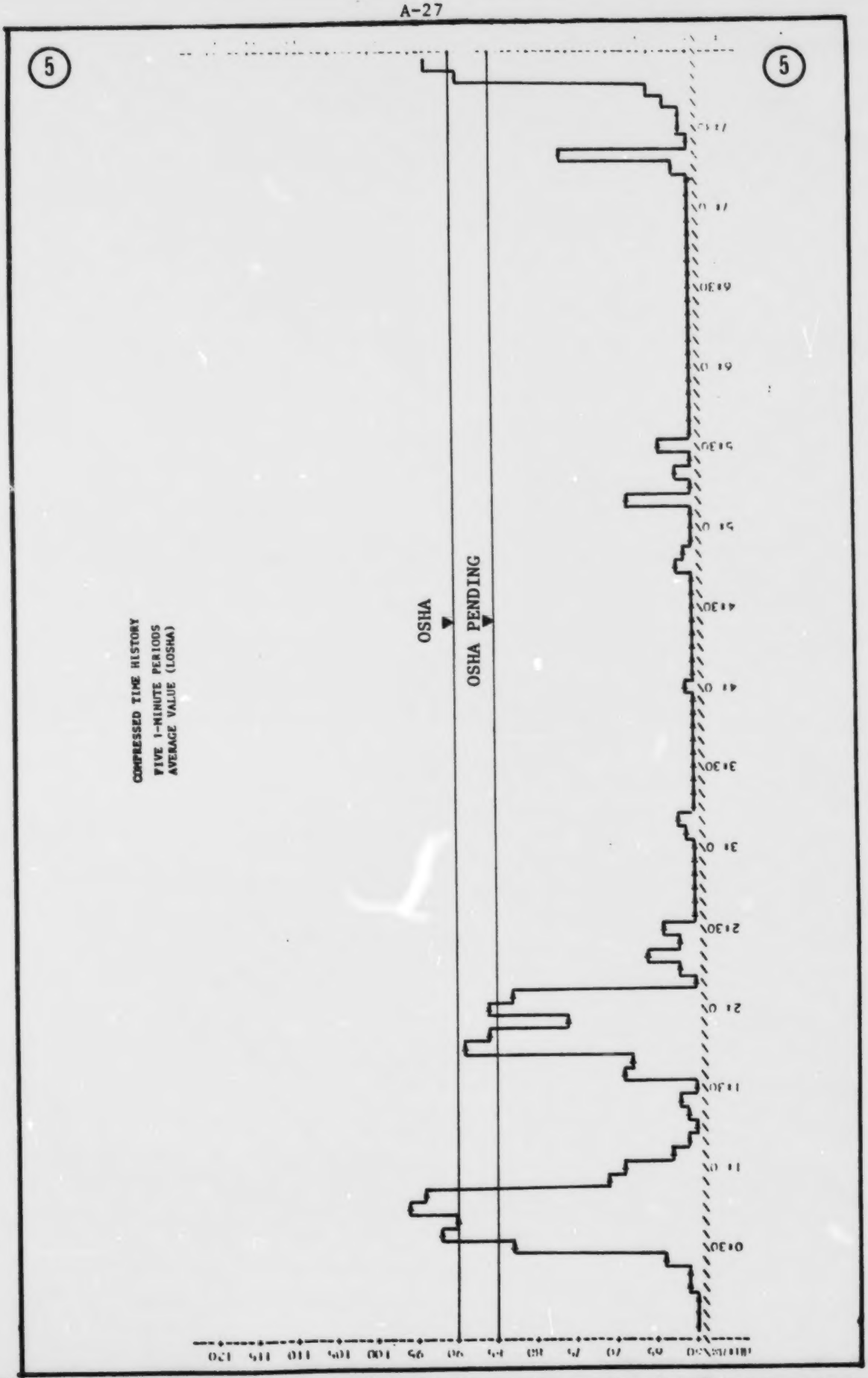
AMPLITUDE DISTRIBUTION

(5) (5)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
390	81.3	60 TO 64
24	5.0	65 TO 69
13	2.7	70 TO 74
13	2.7	75 TO 79
13	2.7	80 TO 84
3	.6	85 TO 89
12	2.5	90 TO 94
11	2.3	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




5
5
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
dB(A)
0:30
1 0
1:30
2 0
2:30
3 0
3:30
4 0
4:30
5 0
5:30
6 0
6:30
7 0

(6)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1220    60    64     4     1
     106     115200  480
  62  61  61  60  60  64  63  61  62  65  62  62  61  64  62  61
  65  74  64  67  60  63  60  64  71  66  61  72  69  66  61  63
  70  67  68  78  77  68  65  70  78  69  72  89  86  87  91  86
  93  91  88  89  94  89  98  99 101  97 104 107 104 101  93  96
  90 106 103  96  91  97 106  91  90  90  97  97  92  89  83  83
  86  84  84  85  85  85  85  86  85  83  84  90  91  95  85  84
  84  82  85  85  86  93  93  89  84  83  89  93  89  87  92  91
  90  86  87  89  90  91  87  90  90  90  90  92  95  98  96  95
  96  96  85  86  86  85  87  98  88  94 103  93  96  91  87  87
  80  81  86  83  85  88  91  92  92  94  89  92  91  96  91  97
  92  89  91  95  91  87  87  95  86  86  87  85  84  85  89  97
  94 100  91  87  88  90  85  85  96  96  93  89  93 100  88  91
  87  97  96  91  85  94  95  86  88 100  92  91  93  90  86  85
  84  60  69  73  80  92  87  87  85  66  69  62  89  66  94 102
 108 109 102 107 106 103 104 102 100 107 108 105 102 103 103 103
 103 106  99  97 102 101 100 103 101 102  97  92 110 109 106 100
 102 100 104 103 105 100 105  99  99  95 102 104 102 105 104 103
 100  90  92  99  98  94 108 103 100 108 101 100  94  96 107 106
 100  90  98 103 100 110 106 103 102 102 100  94 101 101  91  87
  97  89  83  83  89  91  89  86  89  89  93  95  93  88  83  87
  89  84  76  70  65  85  70  60  77  84  71  84  90  84  86  90
 107  93  95 109  91  86  85  85  88  92 109 102  94  91  89  85
  85  83  84  86  96 102 109 110 106 101  95 110 107 108 106 106
 106 104 102 103 103 105 107  93 106 106 108 105 102 105 104 104
  96 103  96 102  97  80  89  96 104  86  60  64  60  60  70  99
 106 103 103  99  91  87  90  90  87  90  91  92  91  96  85  92
  93  95  88  87  87  89  98  96  90  88  90  89  89  89  95  97
 104 103 103 101  94 110 111 104 105 104 103 104 102 105 105 105
 102  99  98 100 102 103 101  96 100 103  99  95  99 103 104  99
 101  84  91  94  89 100 102  97  88  93  89  81  74  78  81  86
%EOF
```

(6)

```
ENTER LOG DATE (DD/MM/YR) : 15/08/79
ENTER SITE CODE (5 CHARS) : ISH23
ENTER USER CODE (4 CHARS) : 4103
 ENTER JOB CODE (3 CHARS) : RBR
```

```
   DATA LOGGED :15  AUG 1979          DATA ANALYZED : 21 SEPT 1979
       LOGGER : JB-301/26                 SITE CODE : ISH23
SERIAL NUMBER : 1220                       JOB CODE : RBO
     BASELINE : 90 DB                    USER CODE : 4103
DYNAMIC RANGE : 94 DB                    THRESHOLD : 70 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =  8 HRS 0 MINS          STARTAY TIME =  08:06
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100 LOGS = 4 HRS / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 90 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOCAL		JOB	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	87.8	87.8	9.154	9.15
2	92.7	90.7	18.277	27.43
3	91.8	90.9	15.263	42.69
4	97.6	93.4	37.096	79.79
5	102.4	96.3	70.116	149.91
6	95.4	96.2	26.310	176.22
7	100.6	97.0	55.890	232.11
8	92.9	97.5	49.118	281.22

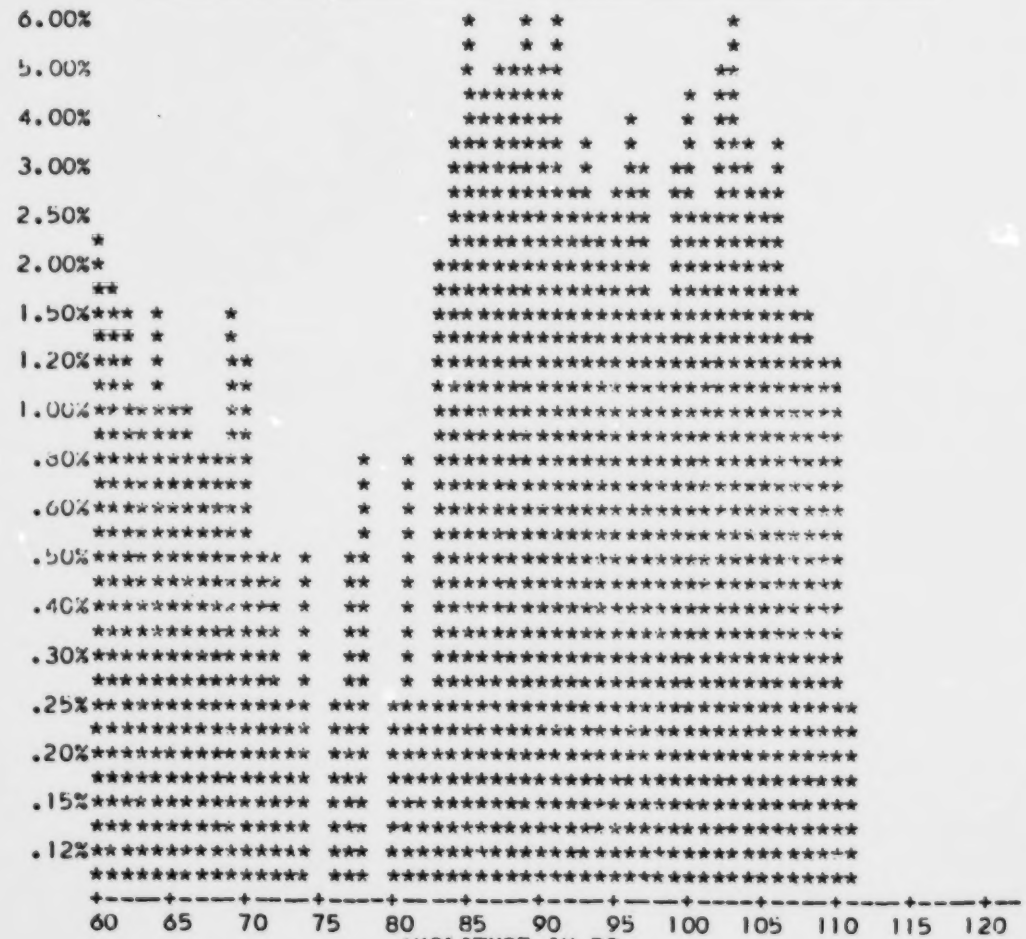
MIN. COMP. = 80 DB MAX. COMP. = 111 DB
ARITHMETIC MEAN = 90 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

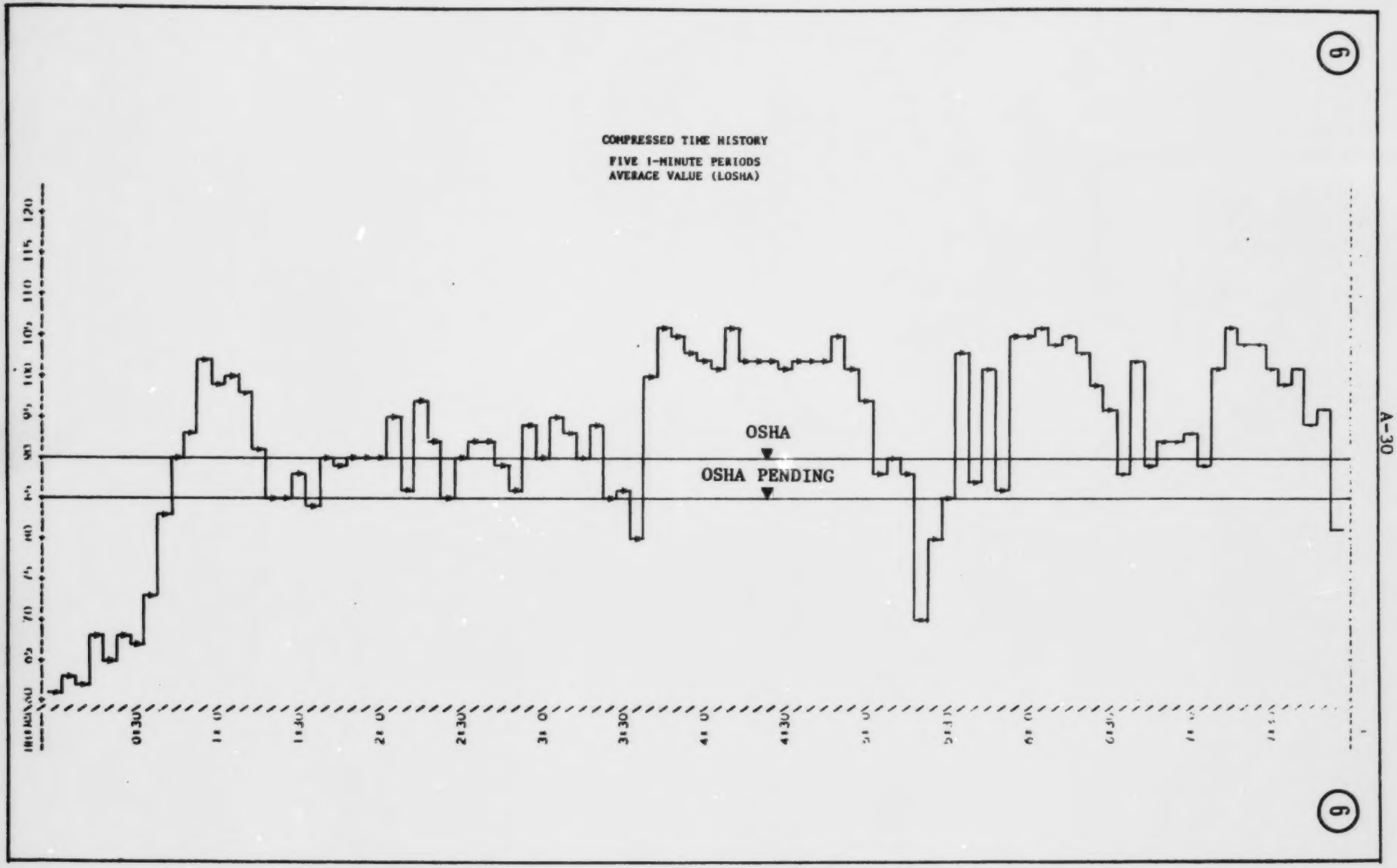
AMPLITUDE DISTRIBUTION

(6) (6)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
32	6.7	60 To 64
20	4.2	65 To 69
12	2.5	70 To 74
6	1.3	75 To 79
27	5.6	80 To 84
107	22.3	85 To 89
82	17.1	90 To 94
58	12.1	95 To 99
87	18.1	100 To 104
43	9.0	105 To 109
6	1.3	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(7)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1216    60    64     4     1
     31      115200  480
 66  61  60  60  60  60  61  70  76  65  67  74  64  63  67  71
 74  67  61  73  63  61  65  63  69  60  61  61  61  70  65  61
 60  78  77  71  77  80  90  87  61  69  82  61  62  74  73  71
 61  60  60  61  70  70  60  60  60  60  60  66  74  60  60
 64  76  80  79  62  60  74  66  60  67  61  65  68  61  60  60
 60  60  60  60  60  60  70  64  62  60  62  63  61  65  67  71
 83  87  89  84  83  86  89  95  74  60  60  60  60  60  93  89
 69  75  83  72  87  86  92  83  60  79  92  82  82  83  66  79
 75  69  89  90  84  87  82  70  62  80  79  66  61  60  60  61
 69  60  77  85  87  97  86  82  99  89  85  93  92 100  94 101
 93 101 100 102 106 101  97  97 102 107 101  94 100 103 103 103
 93  89 105 111 111 104  93 103  97  96  83  90  65  64  65  63
 61  69  75  60  60  60  78  93 101 104  86  72  76  90  94  93
100 101  99 105 103 100 102  88  95 101  88  75  90  94  97  85
 77 100  99  81  76  73  77  62  69  75  61  60  60  79  66  70
 81  81  63  80  62  65  72  68  69  65  78  67  75  68  61  60
 65  61  65  67  70  61  63  67  61  60  61  65  69  65  64  60
 60  60  62  60  71  64  71  60  60  65  65  68  60  63  66  65
 63  60  60  60  60  60  60  60  67  64  65  70  71  81  80  72
 77  81  73  91  96  99  93  96  81  71  69  95 104  97  94  90
 71  77  69  76  77  75  61  60  74  77  78  62  60  60  69  79
 83  90  68  60  60  60  65  65  63  60  65  82  86  60  60  87
 82  90  83  77  83  83  78  85  60  60  60  60  66  60  60  60
 60  63  88  93  69  72  69  68  61  60  64  60  60  79  66  62
 60  60  73  67  91  91  82  63  88  84  88  90  85  64  66  70
 69  65  93  89  97  95  76  82  82  80  81  78  77  79  80  73
 94  87  91  90  85  89  98  87  86  97  98  98  92  91  96  90
 96  93  83  79  80  77  74  60  69  62  81  85  86  80  77  62
 60  69  60  70  71  67  60  72  60  60  61  60  64  63  60  60
 65  78  77  93  89  62  70  60  68  62  60  68  68  60  66  64
%EOF
```

(7)

```
ENTER LOG DATE (DD/MM/YR) : 16/08/79
ENTER SITE CODE (5 CHARS) : 00000

ENTER USER CODE (4 CHARS) : 4550
 ENTER JOB CODE (3 CHARS) : RBO
```

```
   DATA LOGGED :16  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : HS-301/26                 SITE CODE : 00000
SERIAL NUMBER : 1216                        JOB CODE : RBO
      BASELINE : 60 DB                      USER CODE : 4550
DYNAMIC RANGE : 64 DB                     THRESHOLD : 40 DB
SAMPLING RATE : 4/SEC                 TOTAL SAMPLES =  115200
TEST DURATION =  8 H 58 M 0           STANDBY TIME =  0 H 38 M 7
```

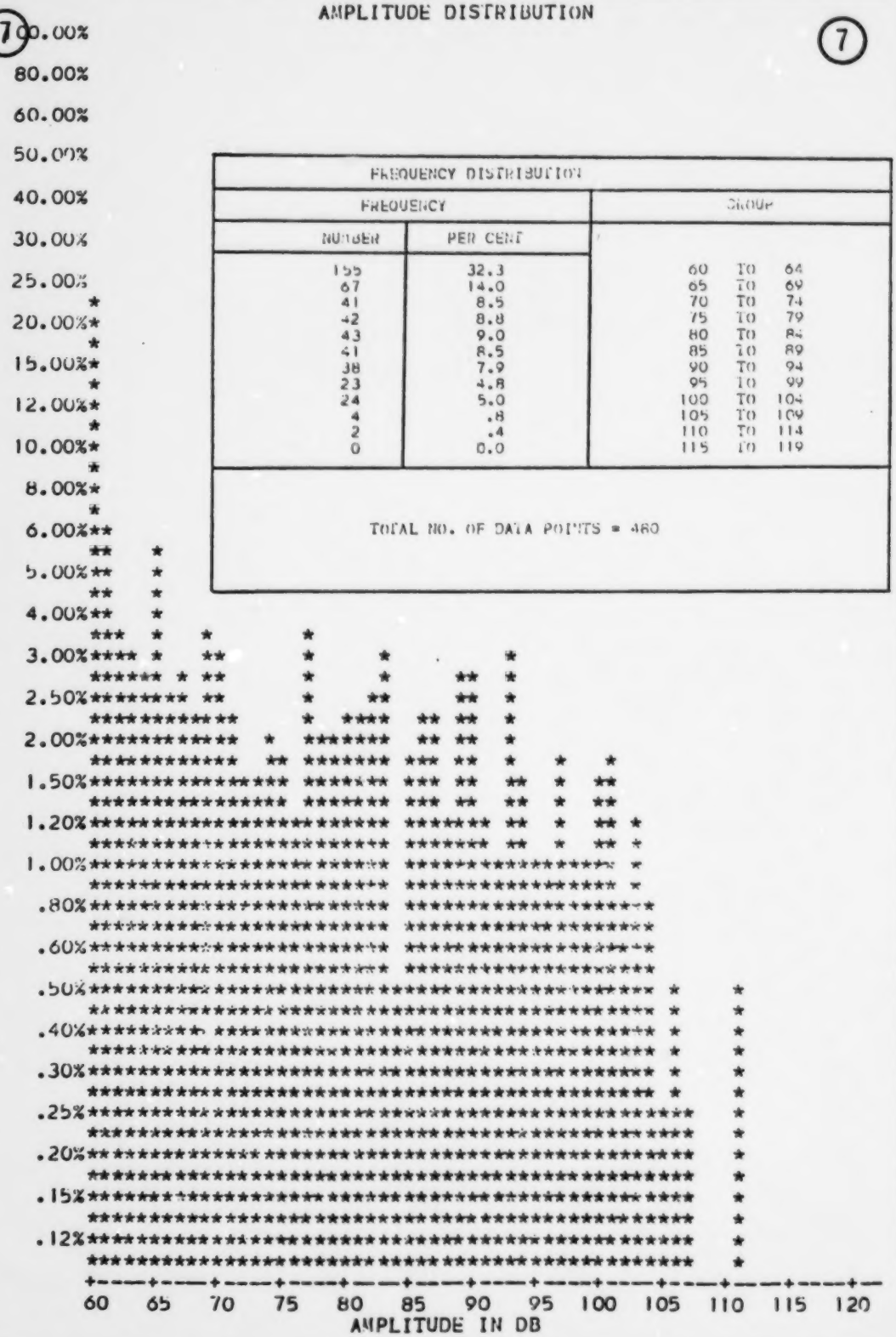
TIME HISTORY ANALYSIS

```
NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE RATE (DOUBLING RATE) = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

HOUR          LOCAL                    DOSE
      CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1     71.8      71.8          1.000      1.00
   2     80.3      77.2          3.247      4.25
   3     90.0      84.1         38.737     42.98
   4     94.8      91.0         54.949     97.92
   5     67.6      89.4           .578     97.50
   6     86.3      89.0          7.466     99.26
   7     83.2      88.4          4.470     99.73
   8     66.1      88.1          0.365     99.73
MIN. COMP. =  60 DB              MAX. COMP. = 111 DB
ARITHMETIC MEAN =  74 DB
STD. DEVIATION =  14 DB
VARIANCE =  194.5 DB
```

AMPLITUDE DISTRIBUTION

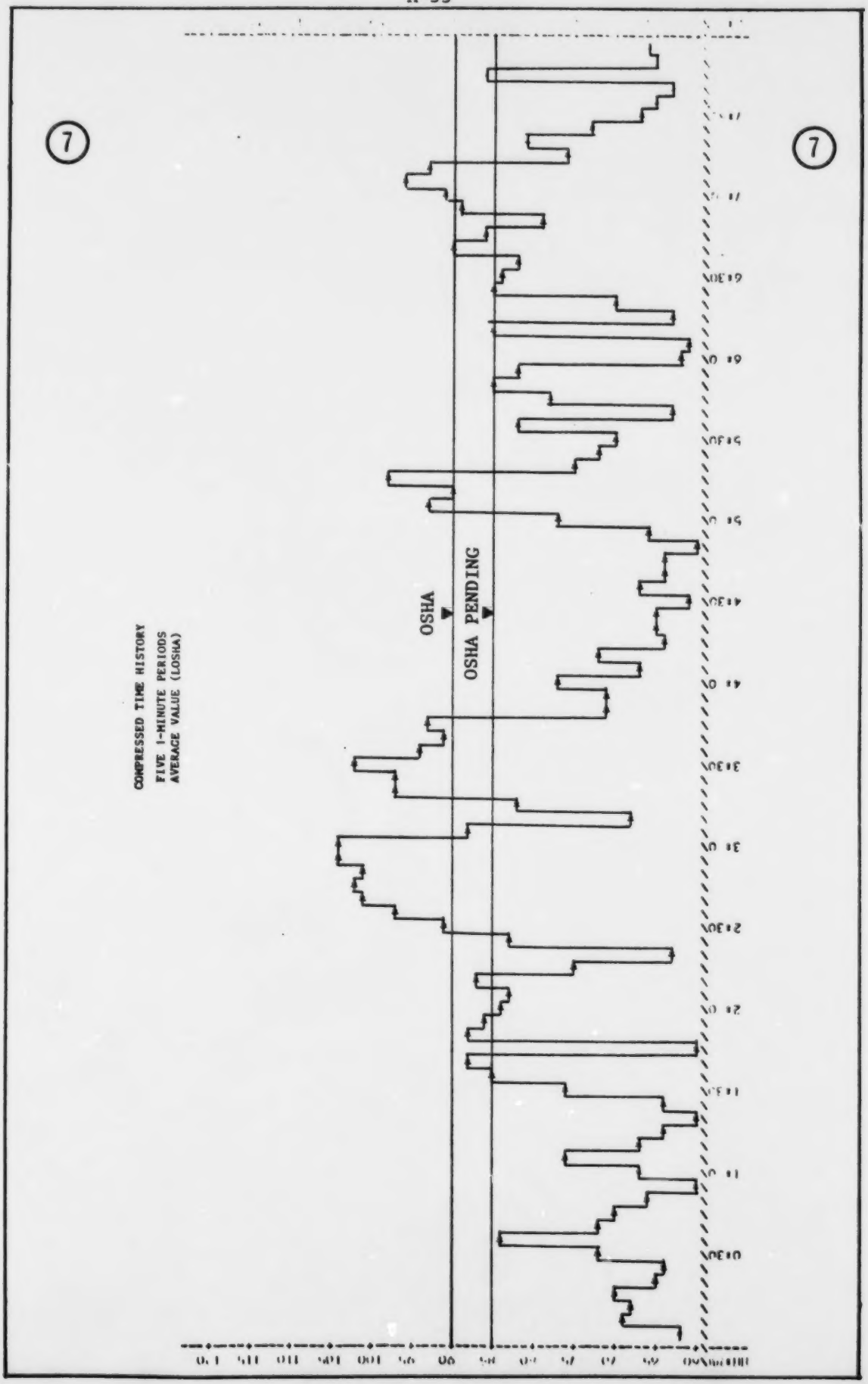
(7) (7)



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
155	32.3	60 TO 64
67	14.0	65 TO 69
41	8.5	70 TO 74
42	8.8	75 TO 79
43	9.0	80 TO 84
41	8.5	85 TO 89
38	7.9	90 TO 94
23	4.8	95 TO 99
24	5.0	100 TO 104
4	.8	105 TO 109
2	.4	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


7
7
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

```
  1  26  80  1213    60    64     4     1
     184      115200  480
 70  69  67  60  65  65  73  68  62  70  69  71  70  62  63  66
 67  82  79  84  84  98  87  91  95  93  97  90  93  95  93  92
 92  97  89  86  81  50  60  62  63  60  60  61  60  63  60  60
 63  60  60  60  60  60  60  62  83  84  88  97 103 104 104 104
104 103 106 104 104 104 103 104 104 103 102 104 104 104 103 102
101  94  95  91  92  94  87  90  91  92  91  90  87  87  87  94
 87  87  91  98  98  98 103 102 102 103 103 105 104 104 104 103
103 103 102 102  95  95  99  99  97 100 101 101 104 102 102  99
 95  78  79  76  71  99  95  94  88  85  92 101  97  77  94  92
 92  92 102  97  99 102 104 104 105 104 103 104 103 103 101 105
104 103 102 102 103 103 103 102  99  97  93  90  90  92  94  90
 90  88  93  92  97  98  84  85  84  84  87  60  60  60  60  79
 94  99 104 103 102 102 102 104 103 103 103  97  95  93  91  90
 85  85  88  87  93  95  93  91  99 104 103 104 103 103 103 103
 97 101 103 102 102  98  94  86  94  98  91  80  65  70  63  76
 88  72  66  77  67  77  80  60  62  60  80  99  95  85  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  64  60  61  61  60  61  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  87  85  91  84  86  87
 88  90  87  89  87  86  87  86  80  86  93  86  83  86  88  93
 95  99 101 103 103 102 100 103 103 103 102  98 103 102 101  99
 90  83  87  97 100  99  99  98 102 103 102 102  98  97 100 101
100 101 101 101 101 101 102 104 103 102 101  94  88  91  93  91
 87  87  90  87  95  94  84  84  90  96 100 104 104 103 102 104
104 104 102 101 101 102 102 102 103 104 102  93  82  78  86  82
 86  90  89  86  86  87  96  95  87  86  84  85  84  85  87  92
 89  84  84  86  84  82  95  96  94  97  91  81  82  84  85  84
 90  90  81  83  82  68  63  62  60  60  60  60  60  60  60  60
 60  61  60  67  65  60  64  67  60  77  84  77  60  60  60  60
 60  60  60  60  60  61  67  60  60  60  76  83  90  90  95  94
$EOF
```

ENTER LOG DATE (DD/MM/YR) : 20/08/79
ENTER SITE CODE (5 CHARS) : 30950
ENTER USER CODE (4 CHARS) : 4262
ENTER JOB CODE (3 CHARS) : 271

DATA LOGGED :20 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1213
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 HR 0 M

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 30950
JOB CODE : 271
USER CODE : 4262
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0 HR 0 M

TIME HISTORY ANALYSIS

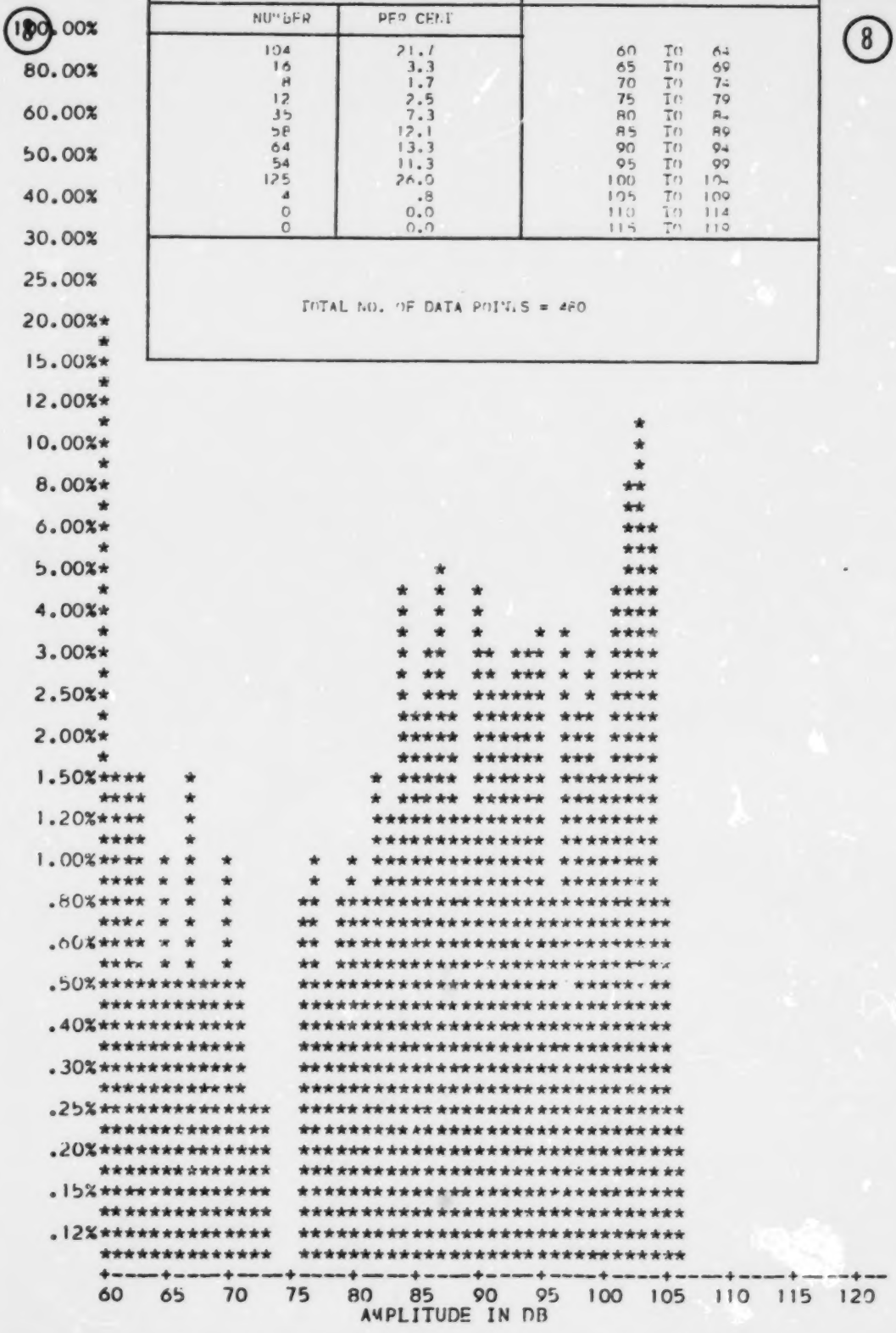
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL TIME = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

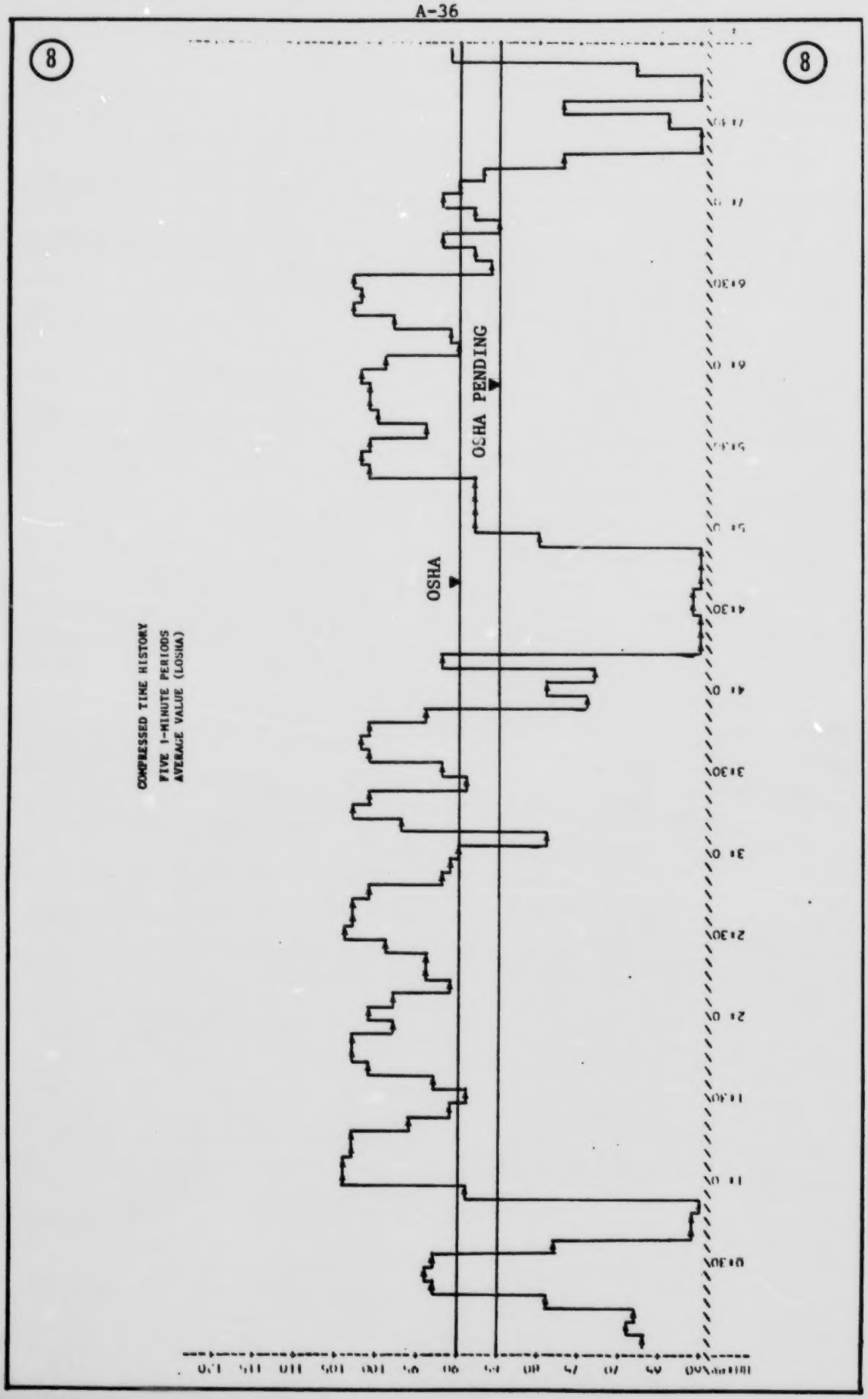
TIME	LOGIA		DOSIS	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.2	85.2	6.410	6.41
2	100.6	96.4	54.287	60.70
3	99.1	97.4	44.195	104.89
4	97.3	97.4	34.508	139.40
5	76.8	95.9	2.010	141.41
6	98.2	96.3	38.823	180.23
7	95.6	96.4	31.416	211.65
8	83.2	95.6	4.852	216.50

MIN. COMP. = 60 DB MAX. COMP. = 106 DB
ARITHMETIC MEAN = 85 DB
STD. DEVIATION = 16 DB
VARIANCE =256 DB

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
104	21.7	60 TO 64
16	3.3	65 TO 69
8	1.7	70 TO 74
12	2.5	75 TO 79
35	7.3	80 TO 84
58	12.1	85 TO 89
64	13.3	90 TO 94
54	11.3	95 TO 99
125	26.0	100 TO 104
4	.8	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

(8)




8
8
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(9)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  20  80  1214   60   64    4    1
     118     119200  460
  60  60  60  60  60  60  60  60  60  60  60  61  60  60  66  69
  69  65  71  60  60  61  65  60  65  62  62  60  60  67  65  65
  61  67  90  92  93  90  86  87  95  90  86  80  85  86  91  80
  65  69  66  60  60  60  60  60  62  60  69  63  60  60  60  60
  60  61  66  65  60  60  60  77  67  61  72  60  63  70  79  75
  81  71  61  62  64  62  60  83  80  78  79  87  86  86  89  88
  87  91  87  86  88  87  89  88  87  87  87  87  87  87  87  87
  87  87  87  87  87  87  86  86  85  85  90  90  87  85  85  85
  86  86  86  87  85  80  81  83  84  79  81  81  81  81  86  86
  86  82  86  86  84  79  80  70  60  61  60  60  64  66  60  60
  60  60  60  70  61  60  60  60  60  60  60  60  60  60  60  71
  60  60  61  60  60  62  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  64
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  61  63  64  61  60  74  60  62  60  67  60  60
  60  60  60  61  60  60  66  60  60  60  61  60  60  60  60  60
  60  61  60  60  64  61  60  60  65  62  61  60  60  65  60  60
  60  60  60  60  60  60  60  60  60  61  60  60  60  60  60  62
  60  60  60  61  60  60  61  60  60  60  62  65  65  60  60  60
  60  64  62  60  65  60  66  60  60  70  66  69  74  71  71  63
  92  88  63  76  60  61  62  62  71  92  72  66  61  60  62  85
  93  87  93  86  83  76  67  82  75  62  81  86  80  63  62  60
  60  60  61  61  70  88  83  79  60  90  86  60  60  61  60  60
  60  70  91  93  82  102  96  94  92  94  96  93  93  93  94  99
 101  102  99  94  101  95  96  93  92  94  93  94  95  96  92  94
  94  99  102  98  95  89  91  86  86  89  91  97  92  90  92  91
  88  88  100  97  95  94  94  92  90  93  97  92  88  89  99  94
  79  60  60  60  60  78  91  90  94  95  94  88  78  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
%EOF
```

(9)

```
ENTER LOG DATE (DD/MP/YR) : 21/08/79

ENTER SITE CODE (5 CHARS) : 00371
ENTER USER CODE (4 CHARS) : 4733

 ENTER JOB CODE (3 CHARS) : 213
```

```
   DATA LOGGED :21  AUG 1979          DATA ANALYZED : 25 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 00371
SERIAL NUMBER : 1214                        JOB CODE : 213
     BASELINE : 60 DB                     USER CODE : 4733
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                  TOTAL SAMPLES =  11520
TEST DURATION =   8 H 0 M 0             STARTED AT =   08:00:29
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 460
PERIOD = 1 MINUTES

TIME	LOGIN		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	79.2	79.2	2.815	2.82
2	82.9	81.3	4.660	7.48
3	80.3	81.0	3.258	10.73
4	60.1	72.0	.198	10.93
5	61.6	71.6	.243	11.17
6	77.4	71.6	2.192	13.37
7	92.5	82.5	17.597	30.96
8	89.0	83.7	10.884	41.85

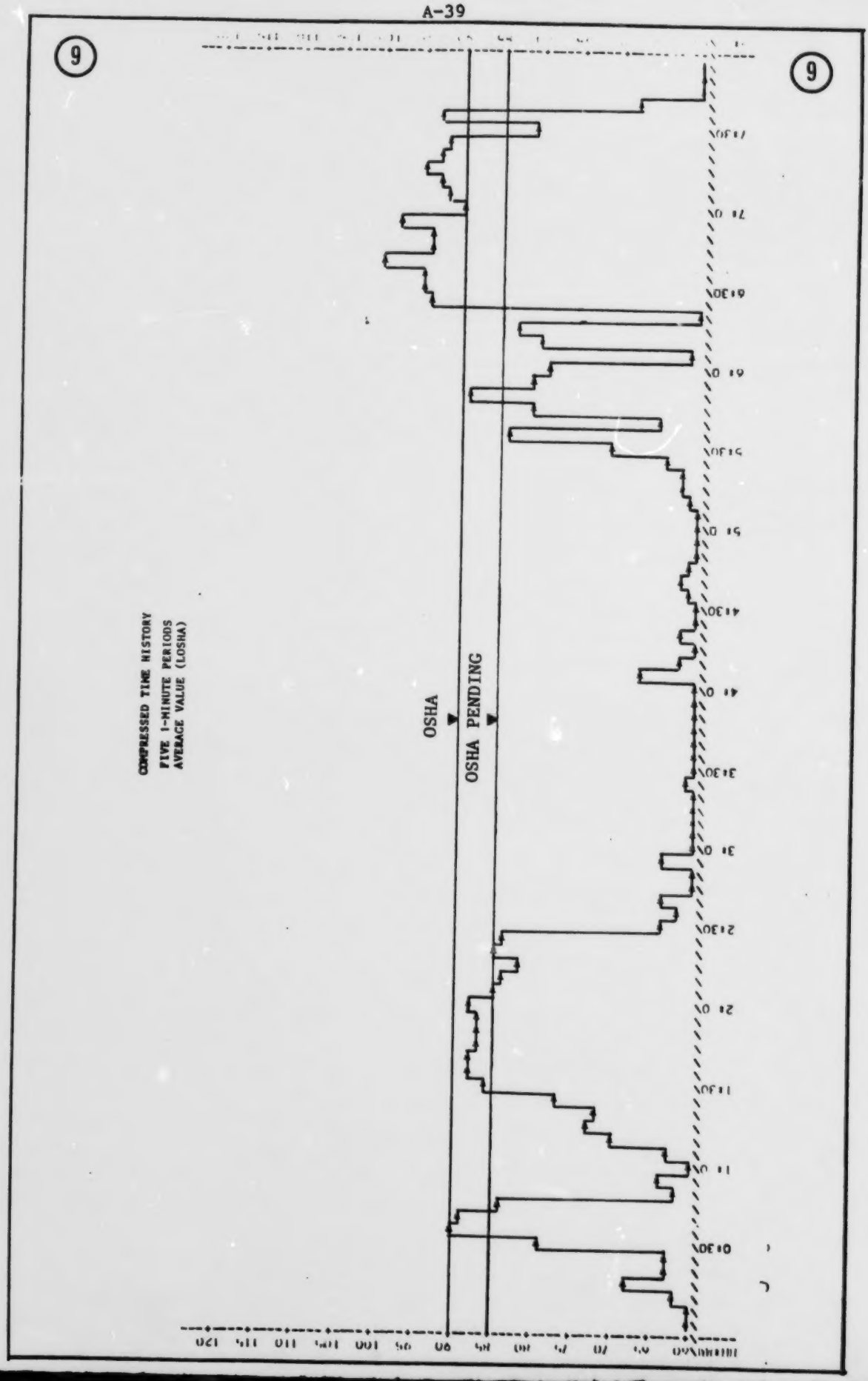
MIN. COMP. = 60 DB MAX. COMP. = 102 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 14 DB
VARIANCE =196 DB

AMPLITUDE DISTRIBUTION

(9) (9)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
262	54.6	60 TO 64
30	6.3	65 TO 69
16	3.3	70 TO 74
14	2.9	75 TO 79
20	4.2	80 TO 84
65	13.5	85 TO 89
49	10.2	90 TO 94
18	3.8	95 TO 99
6	1.3	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


9
9
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1: 0
1:30
2: 0
2:30
3: 0
3:30
4: 0
4:30
5: 0
5:30
6: 0
6:30
7: 0
7:30

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(10) 1 26 80 1213 60 64 4 1 (10)

100 115200 480

62	76	61	60	67	60	60	60	60	60	60	60	60	60	60	63
60	60	60	60	60	63	61	60	60	67	72	67	61	61	68	70
71	74	82	96	95	94	99	91	84	93	88	94	93	92	90	93
85	83	72	74	73	74	61	65	60	67	66	66	72	67	61	72
80	60	68	70	75	70	75	65	66	77	71	74	81	91	84	75
61	79	69	66	65	63	61	73	67	69	62	60	71	60	63	61
60	62	67	73	60	60	60	60	78	73	69	79	64	60	65	69
60	77	60	71	60	60	60	60	60	72	60	60	60	72	83	72
62	68	77	63	60	72	72	75	60	60	60	60	60	60	60	60
60	64	63	76	72	72	71	68	79	72	73	70	60	60	60	74
69	66	61	68	78	67	66	85	77	69	74	64	65	68	65	65
65	72	67	67	70	73	79	66	65	60	63	67	65	67	79	62
73	76	68	69	61	67	77	62	71	69	65	63	72	74	63	75
60	60	60	60	61	70	61	73	80	77	80	64	65	83	60	60
60	60	63	75	83	82	80	82	81	78	80	84	80	79	84	87
77	71	76	73	70	72	60	61	65	79	73	60	70	74	68	75
60	60	72	73	79	80	77	87	62	65	60	82	63	74	69	88
84	83	71	61	65	60	63	75	69	78	66	80	65	60	60	60
70	60	62	60	66	68	60	60	63	60	68	60	68	71	70	75
67	71	71	74	82	62	60	64	72	61	60	69	64	62	65	67
67	74	77	85	60	68	67	66	60	60	60	60	63	75	60	70
60	71	65	72	73	73	70	72	60	60	80	60	60	69	77	74
76	66	65	64	68	67	77	79	80	68	60	60	60	60	60	64
65	60	62	72	60	62	60	60	60	62	77	80	76	60	72	60
62	72	61	60	71	89	81	72	66	60	78	83	68	60	73	79
91	82	71	75	84	72	60	60	60	63	90	90	75	64	78	84
67	60	60	62	64	81	90	83	77	62	60	74	76	60	60	78
88	85	84	78	66	60	64	60	60	60	78	84	82	78	91	85
65	66	65	69	73	71	68	80	65	60	64	70	90	83	83	80
67	61	60	60	60	76	67	81	88	85	63	62	63	61	79	73

:EOF

ENTER LOG DATE (DD/MM/YR) : 23/08/79
ENTER SITE CODE (5 CHARS) : ISRAF
ENTER USER CODE (4 CHARS) : 4731
ENTER JOB CODE (3 CHARS) : 213

DATA LOGGED :23 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1213
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 480 SEC

DATA ANALYZED : 25 SEPT 1979
SITE CODE : ISRAF
JOB CODE : 213
USER CODE : 4731
TOTAL SAMPLES = 115200
SAMPLING TIME = 480 SEC

TIME HISTORY ANALYSIS

DOSE EXPOSURE INDEX (D.E.I.) CALCULATION
ARBITRARY DOSE = 1.0000E-12 I^4
DOSE UNIT = 1 DOSE UNIT
CALIBRATION (DYNAMIC RANGE) FACTOR = 64
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

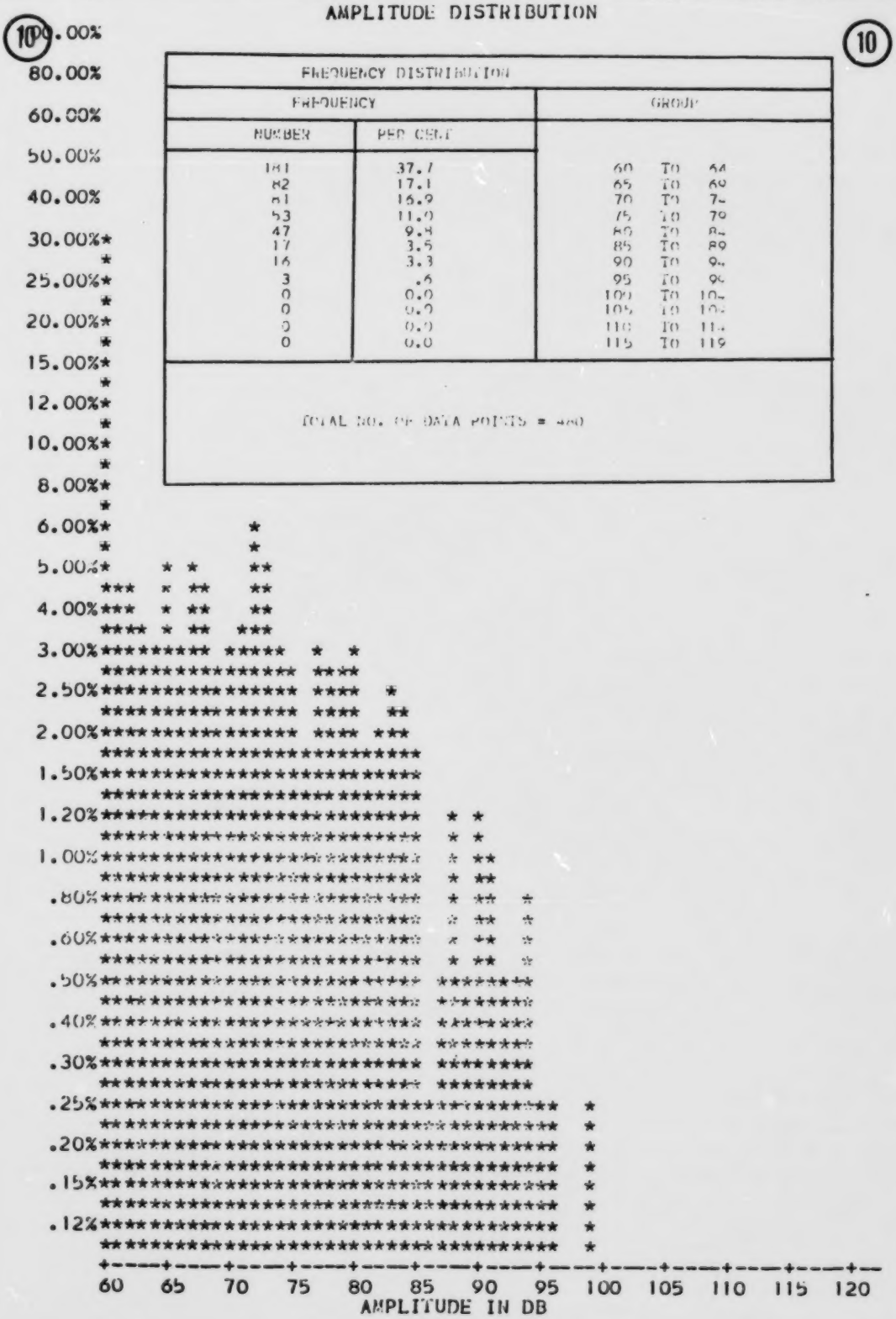
HOUR	LEQ(A) CONTINUOUS	LEQ(A) INTERMITTENT	DOSE OVER CONTINUOUS	DOSE OVER INTERMITTENT
1	83.5	83.2	5.0E-8	5.09
2	79.1	80.5	1.57E-8	6.46
3	71.8	76.5	.935	7.61
4	79.3	77.8	1.52E-8	8.23
5	74.5	77.3	1.44E-8	10.69
6	71.6	76.6	1.00E-8	11.70
7	76.2	76.5	1.05E-8	13.15
8	78.5	76.8	2.53E-8	14.79

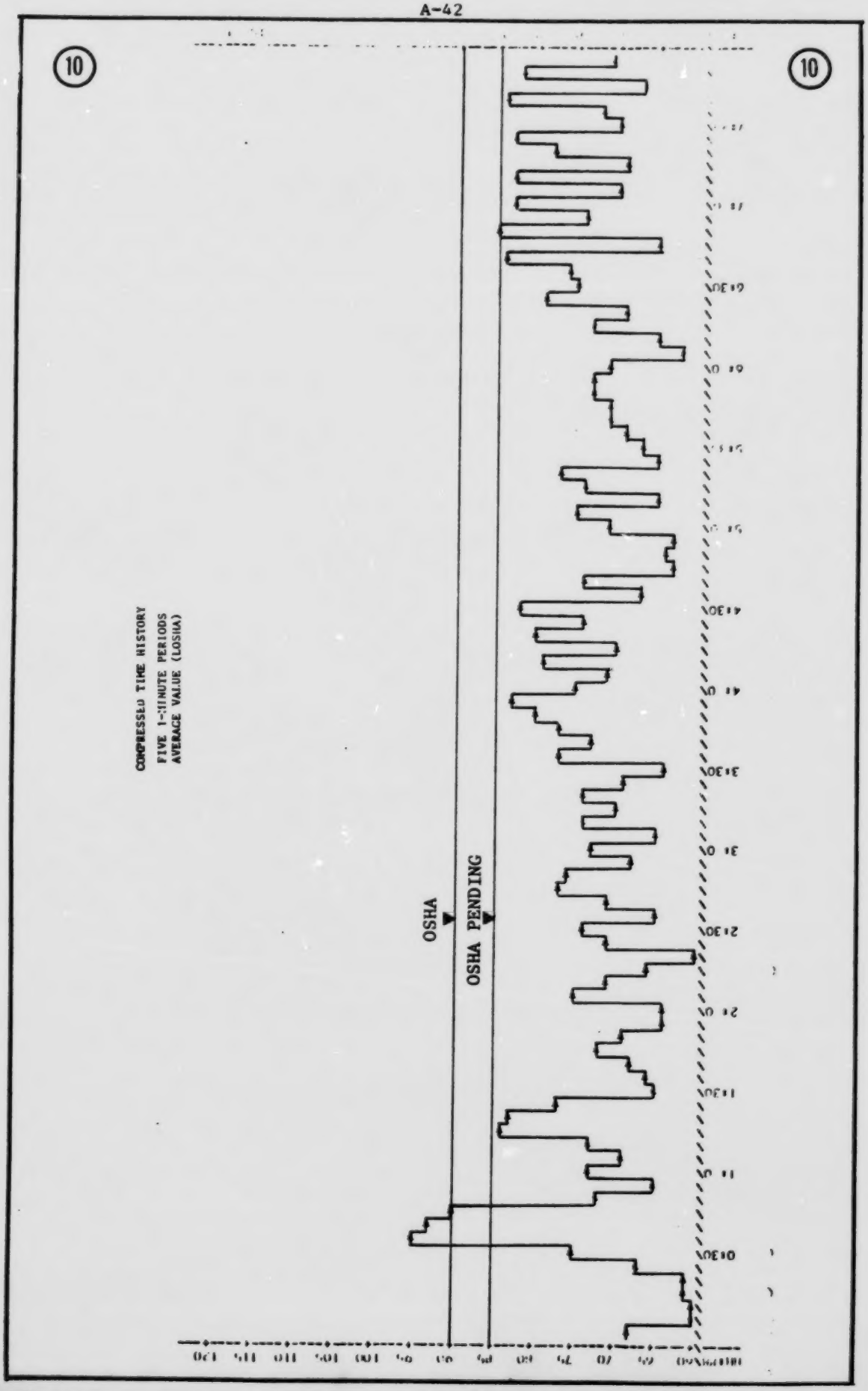
MIN. COMP. = 60 DB MAX. COMP. = 92.59
ARITHMETIC MEAN = 69.DB
STD. DEVIATION = 9.99
VARIANCE = 81 DB

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
181	37.7	60 TO 64
82	17.1	65 TO 69
81	16.9	70 TO 74
53	11.0	75 TO 79
47	9.8	80 TO 84
17	3.5	85 TO 89
16	3.3	90 TO 94
3	.6	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




10
10
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:
1:30
2:
2:30
3:
3:30
4:
4:30
5:
6:
6:30
dB(A)
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

(11)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1216   60   64    4    1
     164     115200  480
  60  60  60  68  61  67  76  61  64  60  61  62  60  69  62  64
  63  83  82  88  94  96  95  85  85 104  87  85  87  88  87  89
  92  88  86  84  83 101  95  99  94  98  96  91  89  95  94  92
  94  92  95  88  91  81  83  81  82  79  83  89  81  81  82  82
  81  82  82  72  69  88  77  74  73  61  63  62  69  82  86  71
  75  79  85  80  88  84  88  91  75  78  72  72  72  73  60  61
  66  60  60  74  10  75  80  60  60  11  67  74  61  24  71  74
  61  75  63  67  75  72  60  60  60  60  69  60   0  60  63  67
  62  76  63  82  85  62  65  83  73  66  73  75  76  66  67  64
  62  60  73  65  80  61  66  60  76  71  67  65  61  80  60  60
  62  65  64  80  84  84  91  83  92  95  96  95  73  92  67  84
  91  61  63  63  85  84  65  90  92  65  61  61  63  61  61  66
  60  60  91  83  81  82  83  94  94  95  94  87  61  82  83  82
  82  81  80  80  81  81  86  82  89  86  87  93  84  80  89  80
  79  79  79  82  85  86  87  86  84  84  83  82  82  83  83  85
  96  91  83  83  86  83  86  81  80  85  87  93  81  81  81  93
  86  81  79  80  83  85  93  86  94  78  76  72  88  80  81  83
  86  97  90  65  79  81  81  81  81  82  81  86  83  86  79  79
  78  81  78  78  78  79  81  80  78  79  79  76  80  79  82  83
  80  83  79  80  81  86  80  80  80  80  80  80  80  87  85  80
  80  80  81  80  84  81  85  83  81  81  80  80  80  81  86  80
  87  83  82  83  83  93  85  84  84  84  83  89  90  81  82  92
  84  85  84  85  84  84  84  89  89  88  91  82  82  82  82  82
  82  83  84  82  86  82  83  85  84  82  83  82  89  88  85  84
  80  81  86  81  82  81  97  99  99  87  83  83  95  94  93  88
  88  98  98  92  83  92  88  84  80  79  85  98 100  93  83  87
  92  89  81  77  83  82  93 100  99  95  85  82  84  89  79  79
  89  98  96  94  94  86  83  85  81  80  80  86  95  89  95 100
  96  84  82  83  81  86  84  87  94  82  81  83  97  98  99  94
  93  83  63  60  60  60  60  60  60  60  60  60  60  61  60  63
%EOF
```

(11)

```
ENTER LOG DATE (DD/MM/YR) : 23/08/79

ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 4460
 ENTER JOB CODE (3 CHARS) : 214
```

```
   DATA LOGGED :23  AUG 1979                DATA ANALYZED : 25 SEPT 1979
        LOGGER : DD-3C1/26                      SITE CO[illegible] : ISHAF
SERIAL [illegible] : 1216                       [illegible] : 41
     [illegible] : 50 [illegible]               [illegible] : [illegible]
[illegible] : 64 [illegible]                    [illegible] :
[illegible] : 4/SEC                        TOTAL SA[illegible] =  [illegible]
[illegible] =  23 : 8 0                         [illegible] =  [illegible]

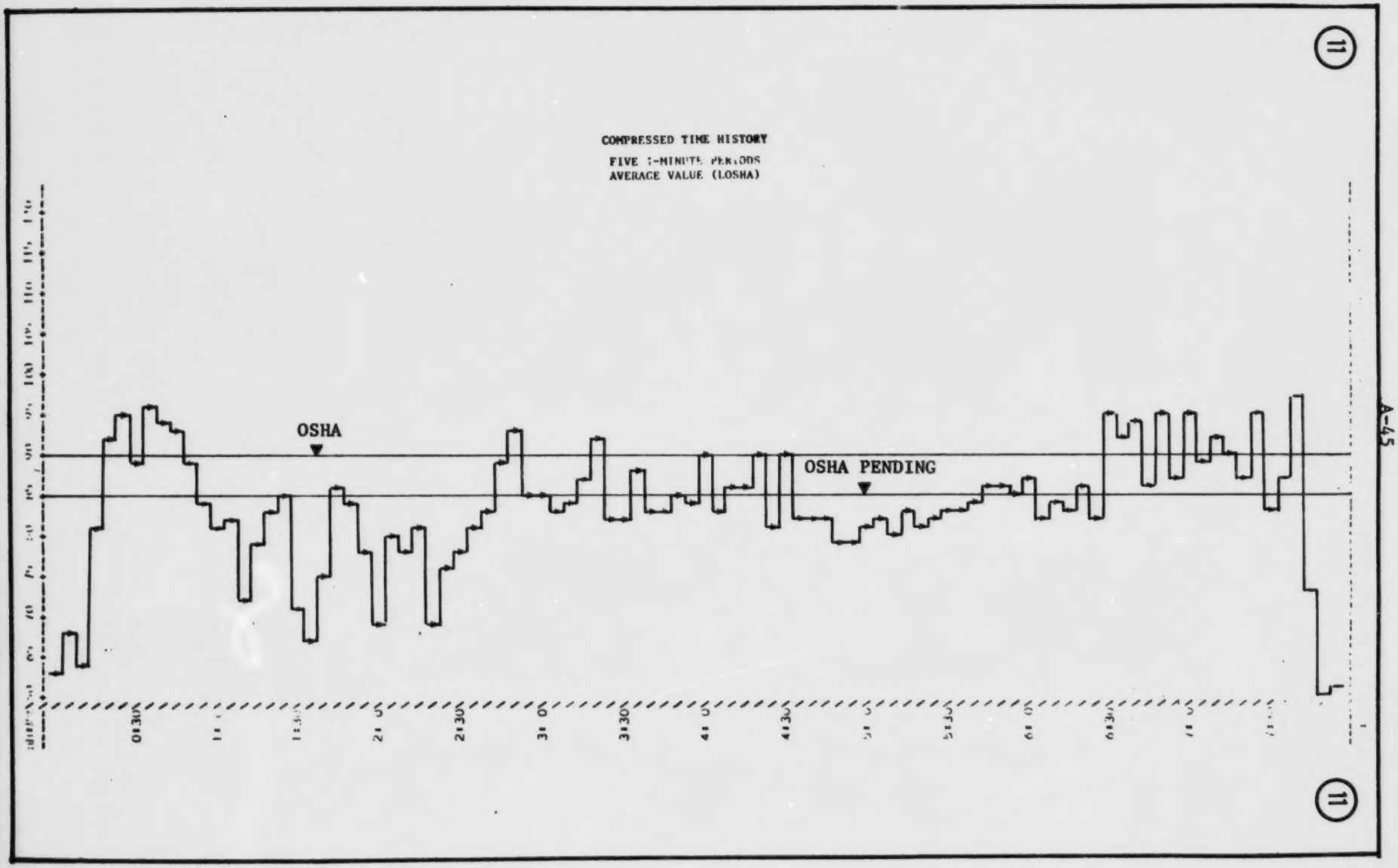
                [illegible] ANALYSIS

[illegible] [illegible] [illegible] [illegible] CALCULATIONS
[illegible] [illegible] [illegible] [illegible]
[illegible] = [illegible] / [illegible]
[illegible] ([illegible]) [illegible] = [illegible]
[illegible] ([illegible]) [illegible] = [illegible]
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

[illegible]          LOCAL
 [illegible]  [illegible]  CUMULATIVE        [illegible]
   1          89.7          89.7             11.9[illegible]      11.9[illegible]
   2          86.6          86.5              3.3[illegible]      15.[illegible]
   3          93.4          89.6              [illegible]         [illegible]
   4          85.4          88.5              [illegible]         [illegible]
   5          89.2          89.5              5.[illegible]       35.41
   6          93.4          89.2              5.020               3[illegible]
   7          89.4          89.3             11.493               [illegible]
   8          89.6          89.5             11.[illegible]       [illegible]
[illegible] [illegible] =  [illegible]                  PAR. COMP. = [illegible]
ARITHMETIC [illegible] =  [illegible]
STD. [illegible] =  [illegible]
[illegible] =  [illegible]
```

(10) (11)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
49	10.2	60 TO 64
12	2.5	65 TO 69
16	3.3	70 TO 74
39	8.1	75 TO 79
197	41.0	80 TO 84
89	18.5	85 TO 89
42	8.8	90 TO 94
31	6.5	95 TO 99
5	1.0	100 TO 104
.	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


COMPRESSED TIME HISTORY
FIVE :-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(12)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214   60   64    4    1
     207     115200  480
 60  60  60  60  60  73  73  69  69  62  65  68  61  61  61  62
 68  61  61  64  62  65  63  72  67  63  60  61  60  63  60  62
 62  65  68  69  71  67  70  63  67  68  61  64  73  67  69  66
 88  85  85  96 101  98  89  91  88  92  91  93  98 101  95  89
 98  93 103 100  96 101  92  90  91  83  87  92  81  82  82  92
 93  83  85  87  81  83  89  86  84  95  85  86  86  94  86  91
 85  91  89  84  83  84  87  89  87  96  86  84  86  86  86  87
 86  85  85  83  85  88  87  86  84  83  83  83  83  84  71  78
 83  86  87  96  85  76  82  69  76  75  85  76  [illegible]
 86  88  85  86  87  86  87  90  89  89  92  95  84  84  84  84
 84  85  85  89  97  93  86  83  84  97  87  85  88  87  87  87
 87  86  92  96  88  88  87  87  86  96  86  89  92  96  87  89
 86  87  89  85  86  88  90  86  85  86  86  86  86  86  85  92
 87  86  89  93  95  94  93  91  90  86  86  86  85  85  88  90
 97  92  84  87  86  86  86  85  85  85  85  85  85  84  85  87
 68  97  94  82  70  68  60  63  60  60  60  60  60  60  60  60
 67  80  60  60  60  67  60  66  73  60  77  73  62  64  68  87
100 102 103  99 102 103  97  91  88  86  83  91 101  90  84  88
 97  89  96  88  90  97  90  88  91  99 101  91  97  94  97  94
 96  88  91  86  86  86  85  94  88  90  97  87  86  91  86  86
 86  85  85  83  86  98  88  85  82  87 100  94  89  85  96  87
 83  85  86  86  86  89  99 103  97  95  94  96  97  93  89  89
 92  97  86  99  96  99  90  91  90  97  89  90 100 100  95  90
 96  91  94 100  87  85  84  84  99  92  93 100 102 102  97  98
 97  97  99 100  96  99  99  93  88  89  97 101  98  98 104 101
 97  93  94  88  92  86  86  87  91 102 101 101  96  98  96  99
 94 104  84  94  98  98  93  98 106  97 102 100  98  89  90  84
 85  91  86  85  87  95  86  99 100 101  92  90  91  94  96  93
 89  91  85  97 101 101  95 101 105  86  82  83  83  83  88 101
 91  97  94  92  88  84  81  81  96  91  89  99  97  81  83  89
%EOF
```

(12)

```
ENTER LOG DATE (DD/MM/YR) : 17/08/70
ENTER SITE CODE (5 CHARS) : ISNAF
ENTER USER CODE (4 CHARS) : 4103
 ENTER JOB CODE (3 CHARS) : R80
```

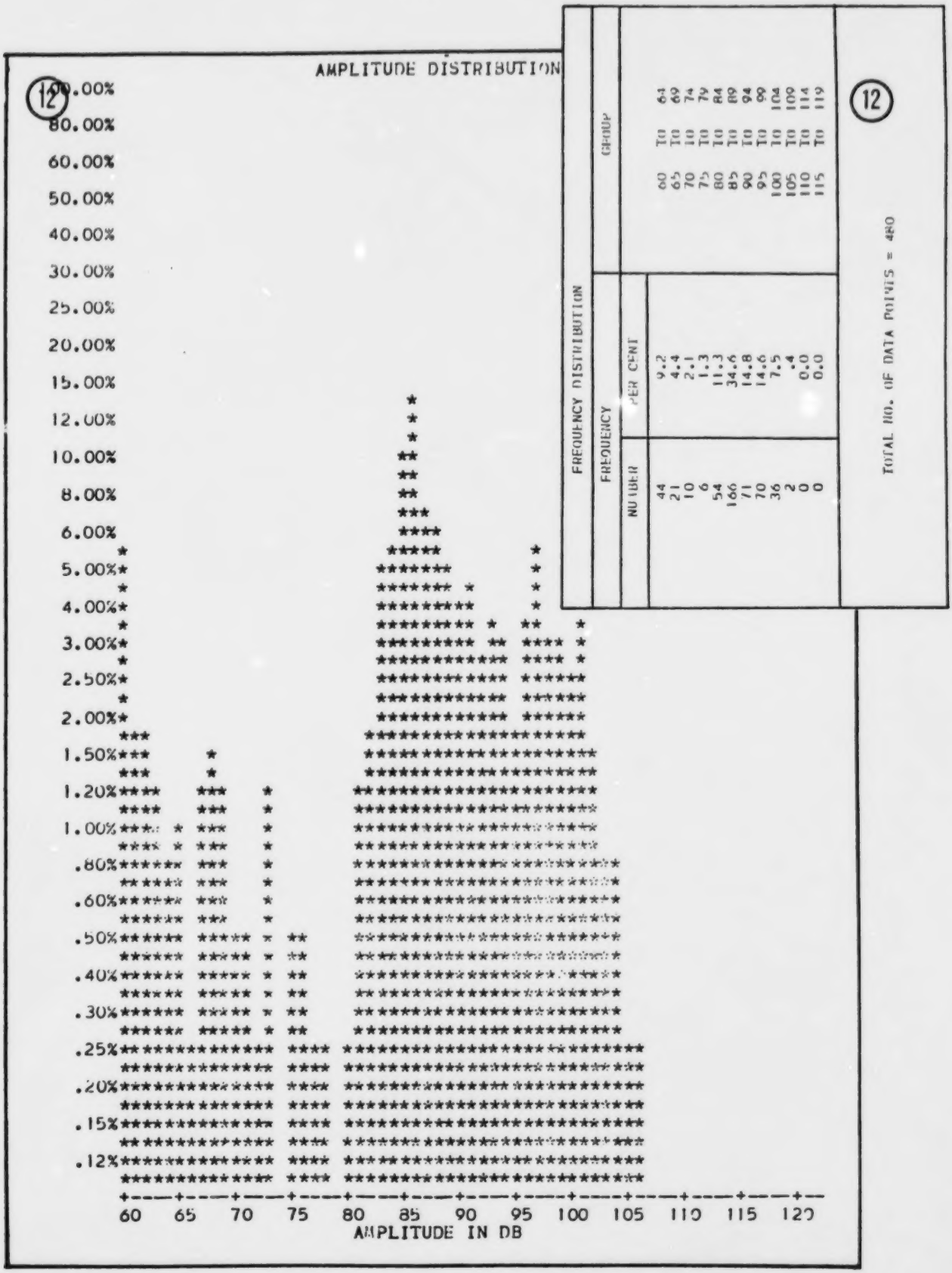
```
   DATA LOGGED :17  AUG 1970          DATA ANALYZED : 21 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : ISNAF
SERIAL NUMBER : 1214                      JOB CODE : R80
    BASELINE : 60 DB                     USER CODE : 4103
DYNAMIC RANGE : 64 DB                    THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =  8 HR 0 MIN 0 SEC      STANDBY TIME =  0 HR 0 MIN
```

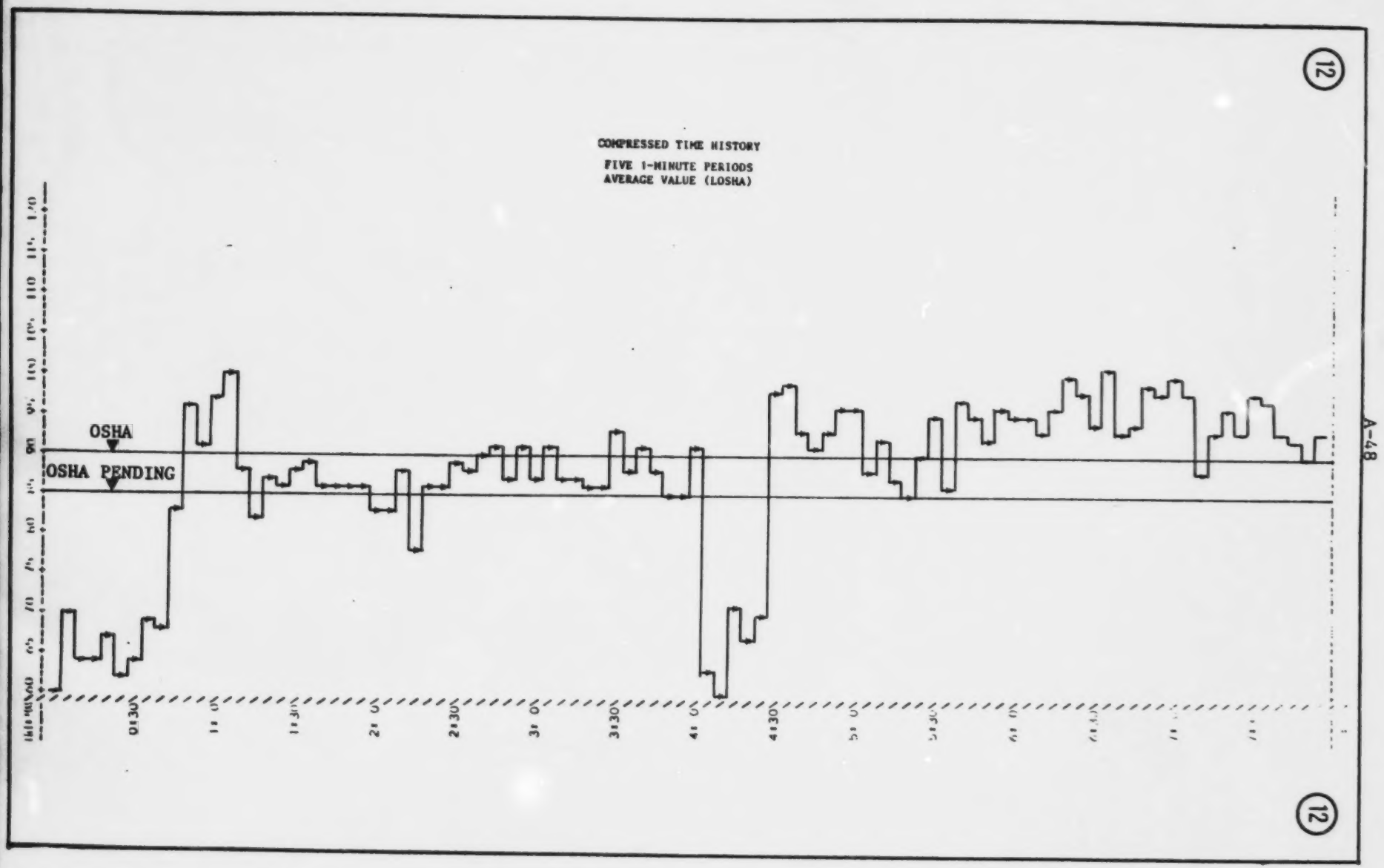
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
Algorithm of the POLARIS
Decibels = 20 Log (P / P ref)
Exchange (Double) Rate = 5 DB
Threshold (Stored) Level = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LEVEL CURRENT	LEVEL CUMULATIVE	POWER CURRENT	POWER CUMULATIVE
1	82.3	82.3	4.308	4.31
2	90.5	87.5	13.470	17.78
3	87.3	87.5	8.636	26.41
4	88.3	87.7	9.204	35.62
5	91.4	88.6	15.257	51.88
6	92.6	89.5	17.972	69.85
7	96.7	91.0	31.690	101.54
8	95.1	91.7	25.216	126.37

MIN. COMP. = 60 DB MAX. COMP. = 106 DB
ARITHMETIC MEAN = 86 DB
STD. DEVIATION = 11 DB
VARIANCE =121 DB


AMPLITUDE DISTRIBUTION
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 To 64 44 9.2
65 To 69 21 4.4
70 To 74 10 2.1
75 To 79 6 1.3
80 To 84 54 11.3
85 To 89 166 34.6
90 To 94 71 14.8
95 To 99 70 14.6
100 To 104 36 7.5
105 To 109 2 .4
110 To 114 0 0.0
115 To 119 0 0.0
TOTAL NO. OF DATA POINTS = 480


12
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
12

(13)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1219   60   64    4    1
     80     115200  480
  60  60  60  60  60  60  60  60  60  60  67  68  61  66  70  60
  63  60  62  65  69  66  69  62  67  61  62  60  60  68  68  60
  62  60  62  60  60  60  65  60  61  65  64  64  70  65  65  63
  64  67  69  68  68  68  67  67  76  61  61  69  63  71  68  71  71
  78  84  93  97  90  71  89  84  93  92  85  89  80  83  84  88
  81  81  82  82  71  83  82  85  91  92  86  87  85  72  82  84
  86  87  88  83  86  84  92  94  97  93 102 105 104 104 101  92
  91  96  99 105 101  97  97  98  97  99  97  97  92  97  98  98
  80  80  93  94  91  89  60  60  60  60  60  65  60  60  60  60
  67  67  71  60  60  60  60  73  60  60  63  97  86  93 104  86
  94  98  90  92  89  92  86  85  91  94  87  60  60  60  60  60
  60  60  60  60  72  60  60  63  60  60  71  87  84  75  71  60
  60  60  60  60  60  60  60  60  60  61  60  62  60  60  60  60
  60  61  60  60  61  65  63  60  60  60  60  65  60  60  60  70
  91  95  92  98  99  98 100  97 100 105 108 105  60  69  60  60
  60  60  64  84  97 101  97 102 106 104  96  82  60  60  60  60
  67  96 101 105 100 107 107 108 107 104 106 107  72  60  75  95
  98 103  98  83  60  61  60  60  60  60  60  60  60  65  60  89
  99  95 104  82  60  60  60  60  60  60  60  60  60  60  60  60
  60  64  60  60  60  60  60  60  60  60  60  61  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  61  60  60  60  60  60
  60  60  60  60  66  60  60  60  61  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  61  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  88  93  81  73  74  87
  99  92  86  70  89  79  66  71  65  73  67  80  69  73  60  66
XEOF

ENTER LOG DATE (DD/MM/YR) : 17/08/79
ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 4635
 ENTER JOB CODE (3 CHARS) : 213

   DATA LOGGED :17  AUG 1979          DATA ANALYZED : 25 SEPT 1979
        LOGGER : DR-3012/2                 SITE CODE : ISHAF
SERIAL NUMBER : 1219                       JOB CODE : 213
      BASELINE : 60 DB                     USER CODE : 4635
DYNAMIC RANGE : 64 DB                      THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                  TOTAL SAMPLES = 115200
TEST DURATION =  80 HR 0                STANDBY TIME =  HR 0120

                TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
LOG BASE = 10 / 10 DB
EXCHANGE (OPERATING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

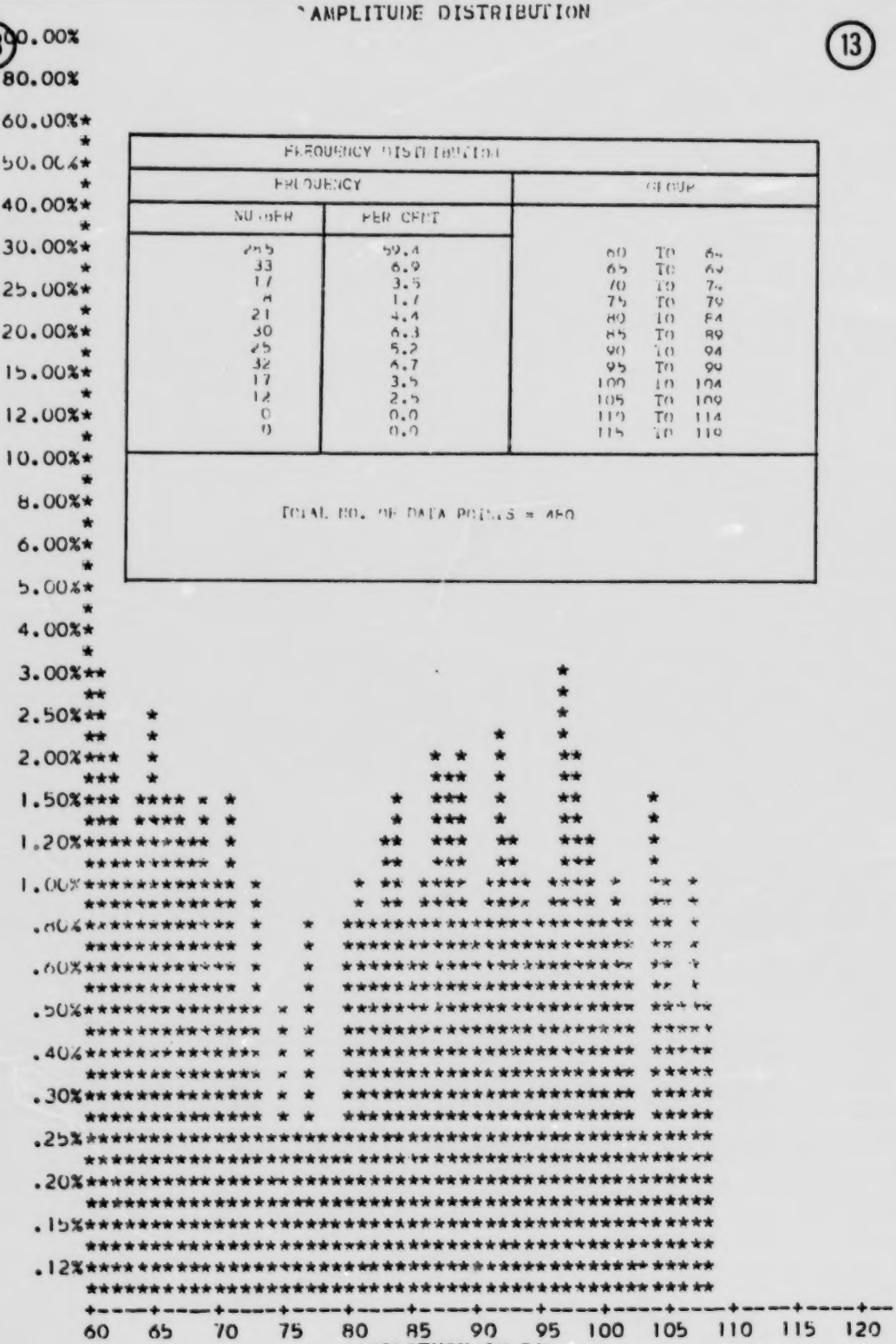
HOUR   TOTAL CUMULATIVE   HOURLY CUMULATIVE
   1      71.3      71.3      .936       .94
   2      92.9      88.2     18.581     19.52
   3      89.4      86.8     11.532     31.04
   4      89.4      86.8     11.483     42.52
   5      96.8      91.3     31.924     74.44
   6      82.0      90.0      .259      74.70
   7      89.0      90.9      .196      74.90
   8      77.9      88.1     2.484      77.38
MIN. COMP. =  60 DB              MAX. COMP. = 108 DB
ARITHMETIC MEAN =  70 DB
STD. DEVIATION =  15 DB
VARIANCE = 220 DB
```

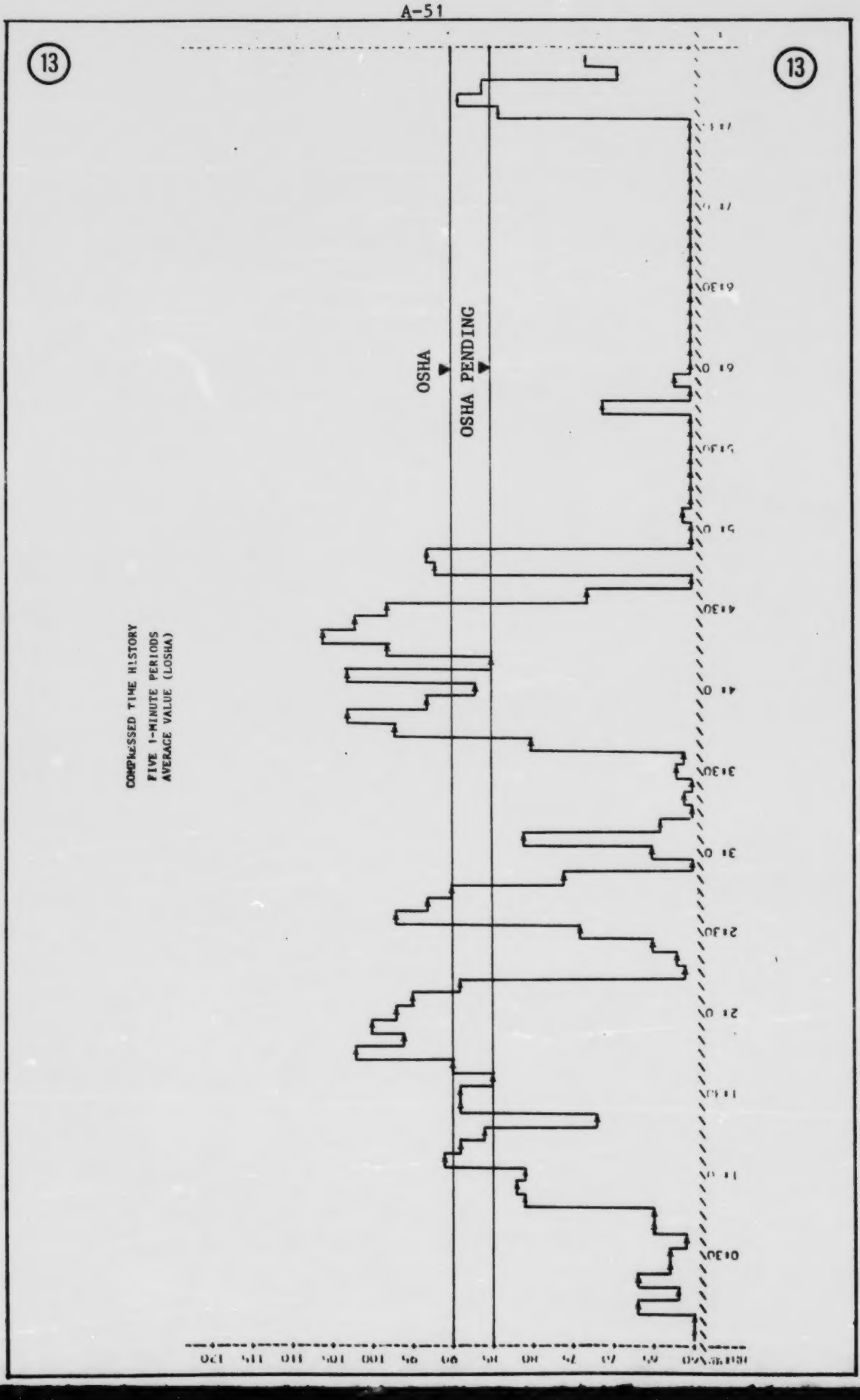
(13)

AMPLITUDE DISTRIBUTION

(13) (13)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
265	59.4	60 TO 64
33	6.9	65 TO 69
17	3.5	70 TO 74
8	1.7	75 TO 79
21	4.4	80 TO 84
30	6.3	85 TO 89
25	5.2	90 TO 94
32	6.7	95 TO 99
17	3.5	100 TO 104
12	2.5	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




13
13
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
0130
1
1130
2
2130
3
3130
4
4130
5
5130
6
6130
7
7130
8
8130
9
9130
10
10130
11
11130
12
12130
13
13130
14
14130
15
15130
16
16130
17
17130
18
18130
19
19130
20

(14)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1215    60    64     4     1
      42     11 00   490
  60  60  60  60  60  60  62  68  73  67  64  63  62  73  68  74
  65  68  71  94  74  76  76  75  73  64  70  74  67  73  72  69
  65  61  61  68  70  66  66  69  69  70  63  61  65  67  66  66
  86  86  84  81  63  73  74  64  83  89  91  90  91  98 101  95
  88  94  96 101 103  99 101  92  96  90  83  84  82  82  82  82
  82  89   0  85  87  81  83  86  89   0  86  84   0  84  82  87
  90  84  93  89  83  82  83  95  90  86  86  83  85  84  86  86
  86  85  85  85  82  84  87  87  86  84  83  83  83  83  85  71
  75  82  86  87  93  91  76  67  69  76  72  85  72  82  88  84
  84  85  86  85  86  87  85  86  91  85  86  90  85  85  84  84
  84  84  85  86  86  97  93  85  83  83  92  95  84  86  83  87
  86  87  86  89  97  87  88  86  87  86  86  86   0  89  97  87
  83  86  86  86  86  85  87  90  85  86  85  85  85  85  86  85
  87  87  86  88  92  89  96  93  90  91  86  86  85  85  85  87
  89  97  93  84  87  85  86  86  85  85  85  85  85  85  84  85
  85  88  96  90  84  63  69  62  63  60  60  60  60  60  66  62
  60  63  82  66  61  60  80  64  70  74  60  71  78  60  63  60
  78  93 102 102 103  93 104 100  95  89  85  84  84  98  98  84
  83  92  95  96  90  87  97  91  89  92  92 101  97  94  91  94
  97  90  95  90  88  87  86  86  85  95  89  91  97  86  85  92
  85  85  84  85  82  82  88  96  85  84  81  91 100  93  85  87
  98  84  84  84  85  85  86  90 101 104  94  94  95  95  95  92
  90  86  98  89  89  99  96  96  88  90  91  98  88  94 101 100
  93  90  96  91  96  99  85  83  84  86 100  90  93 102 102 102
  95 100  92  99  97 100  99  97 100  92  87  88  99 102  98  98
 104 100  97  92  93  87  92  84  85  88  94 102 102 101  95  97
  96  99  94 107  84  95  99  97  93  97 108  96 103  99 100  89
  91  84  84  92  85  84  88  96  87 100 101 102  91  90  91  95
  96  92  89  90  85  96 102 100  94 102 105  87  83  83  83  83
  88 101  91  97  94  92  88  82  83  84  97  93  86  99  95  78
$EOF
```

(14)

```
ENTER LOG DATE (DD/MM/YR) : 17/08/79
ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 4685
 ENTER JOB CODE (3 CHARS) : RBC
```

```
   DATA LOGGED :17  AUG 1979          DATA ANALYZED : 21 SEPT 1979
      LOGGER : DR-301/26                 SITE CODE : ISHAF
SERIAL NUMBER : 1215                      JOB CODE : RBC
     BASELINE : 60 DB                     USER CODE : 4685
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                    TOTAL SAMPLES =  11520
TEST DURATION =  48 00 0                  STANDBY TIME =  00 0000
```

TIME HISTORY ANALYSIS

...OISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
[illegible] DOSE = 90 DB / 8 HRS
[illegible] (THRESHOLD) LEVEL = 5 DB
[illegible] (BASE) LEVEL = [illegible]
NUMBER OF COMPUTATIONS = 490
PERIOD = 1 MINUTES

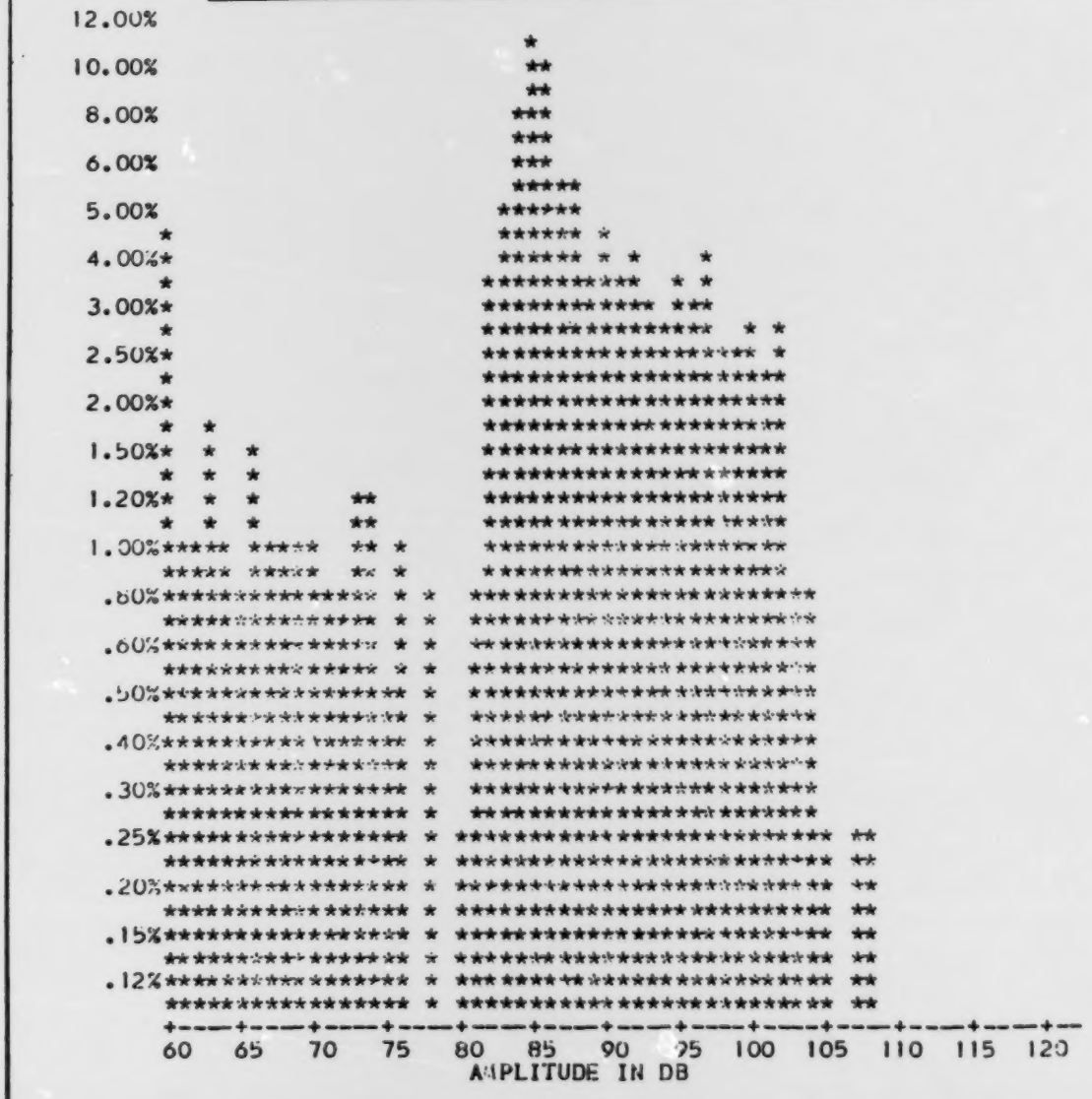
HOUR	LOCAL CURRENT	LOCAL CUMULATIVE	TOTAL CURRENT	TOTAL CUMULATIVE
1	76.9	76.9	2.027	2.03
2	90.4	86.4	13.140	15.17
3	[illegible].6	10.5	7.[illegible]	22.[illegible]
4	84.3	87.0	9.471	32.[illegible]
5	90.9	87.9	14.075	46.93
6	92.5	88.9	17.741	64.67
7	97.0	90.3	32.[illegible]6	97.[illegible]
8	95.5	91.6	26.813	124.37

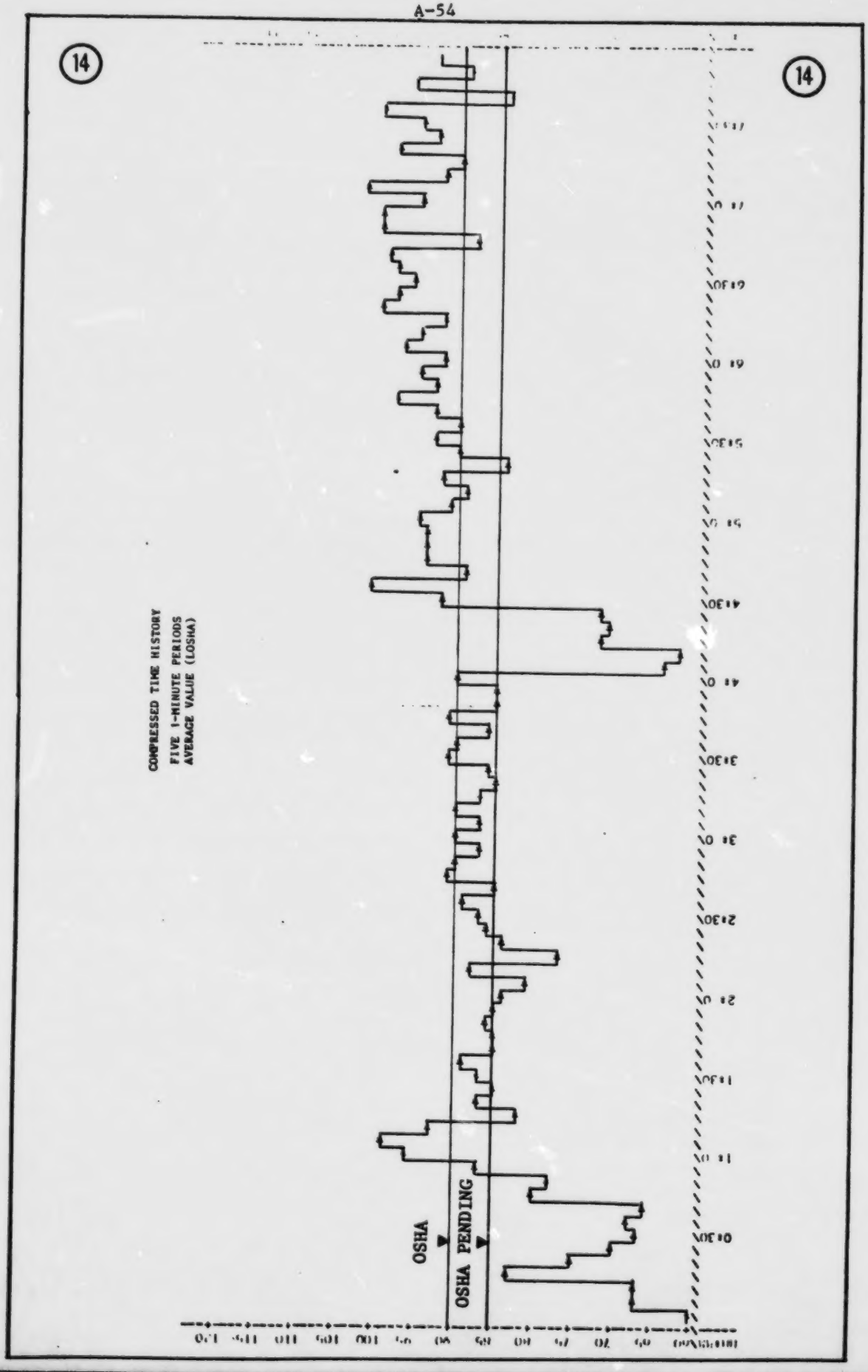
MIN. COMP. = 60 DB MAX. COMP. = 105 DB
ARITHMETIC MEAN = 85 DB
STD. DEVIATION = 11 DB
VARIANCE =121 [illegible]

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
36	7.5	60 TO 64
21	4.4	65 TO 69
20	4.2	70 TO 74
9	1.9	75 TO 79
70	14.6	80 TO 84
148	30.8	85 TO 89
73	15.2	90 TO 94
63	13.1	95 TO 99
37	7.7	100 TO 104
3	.6	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




14
14
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:0
1:30
2:0
2:30
3:0
3:30
4:0
4:30
5:0
5:30
6:0
6:30
7:0
7:30
8:0
8:30
9:0
9:30
10:0
10:30
11:0
11:30
12:0
12:30
13:0
13:30
14:0
14:30
15:0
15:30
16:0
16:30
17:0
17:30
18:0
18:30
19:0
19:30
20:0

(15)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

1 26 80 1221 60 64 4 1
26 115200 480

65	68	75	75	74	69	77	78	65	65	71	62	68	72	72	78
73	83	89	92	97	99	100	99	100	94	91	93	95	98	98	97
98	98	96	97	93	96	98	98	96	98	96	92	76	64	61	60
60	60	60	60	60	63	60	70	70	70	74	74	74	73	75	67
[illegible]															
114	114	114	113	94	97	91	[illegible]								
120	118	119	116	117	116	115	114	111	110	110	111	115	[illegible]		
[illegible]															
95	85	90	91	[illegible]											
90	90	88	88	88	88	88	88	88	88	89	[illegible]				
[illegible]															
84	84	102	[illegible]												
87	87	86	86	87	87	87	86	104	90	89	89	[illegible]			
89	90	90	90	89	89	90	91	90	90	90	90	90	90	90	90
90	90	93	89	90	90	[illegible]									
117	96	94	92	92	93	93	80	80	70	73	69	61	60	60	60
64	60	60	60	61	63	60	60	61	60	61	62	62	60	60	60
60	66	62	60	61	60	60	63	73	73	74	77	65	61	64	66
[illegible]															
64	60	93	97	91	78	73	65	62	60	63	61	[illegible]			
88	81	97	87	95	96	85	69	62	60	63	60	74	84	89	89
83	77	61	73	109	108	107	103	105	106	108	110	111	113	106	106
98	95	92	90	88	87	88	95	87	86	91	86	86	85	80	91
88	89	91	89	88	88	92	94	96	63	64	62	60	60	62	61
60	60	62	60	60	60	60	60	62	70	70	68	64	66	82	88
95	100	102	96	80	96	98	95	93	87	95	98	97	101	97	90
98	99	98	101	98	101	101	98	76	70	85	95	63	60	64	60
71	74	60	62	64	61	60	60	62	51	67	77	90	95	92	92
95	95	90	83	97	99	101	98	101	103	105	104	105	103	103	97

EOF

(15)

ENTER LOC DATE (DD/MM/YR) : 19/07/79
ENTER SITE CODE (5 CHARS) : 00202

ENTER USER CODE (4 CHARS) : 4396
ENTER JOB CODE (3 CHARS) : 291

DATA LOGGED :19 JULY 1979
LOCATION : [illegible]
SERIAL NUMBER : 1221
CABLING : [illegible]
DATA IC CARDS : [illegible]
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

DATA ANALYZED : 14 SEPT 1979
SITE CODE : 00202
JOB CODE : 291
USER CODE : 4396
TEST SIGNAL : [illegible]
TOTAL SAMPLES = 115200
STARTED AT = [illegible]

SITE HISTORY ANALYSIS

[illegible] CALCULATIONS
[illegible]
[illegible]
[illegible]
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
[illegible] = 1 MINUTES

HOUR	LOSS CURRENT	LOSS CORRELATION	[illegible] CURRENT	[illegible] CORRELATION
1	91.1	91.1	14.586	14.59
2	[illegible]	100.1	[illegible]	204.77
3	104.9	104.9	24.743	254.17
4	99.0	103.1	11.829	13.99
5	95.0	102.1	25.005	334.08
6	91.0	101.1	13.924	347.93
7	96.7	100.6	31.002	378.75
8	95.7	100.1	27.402	407.14

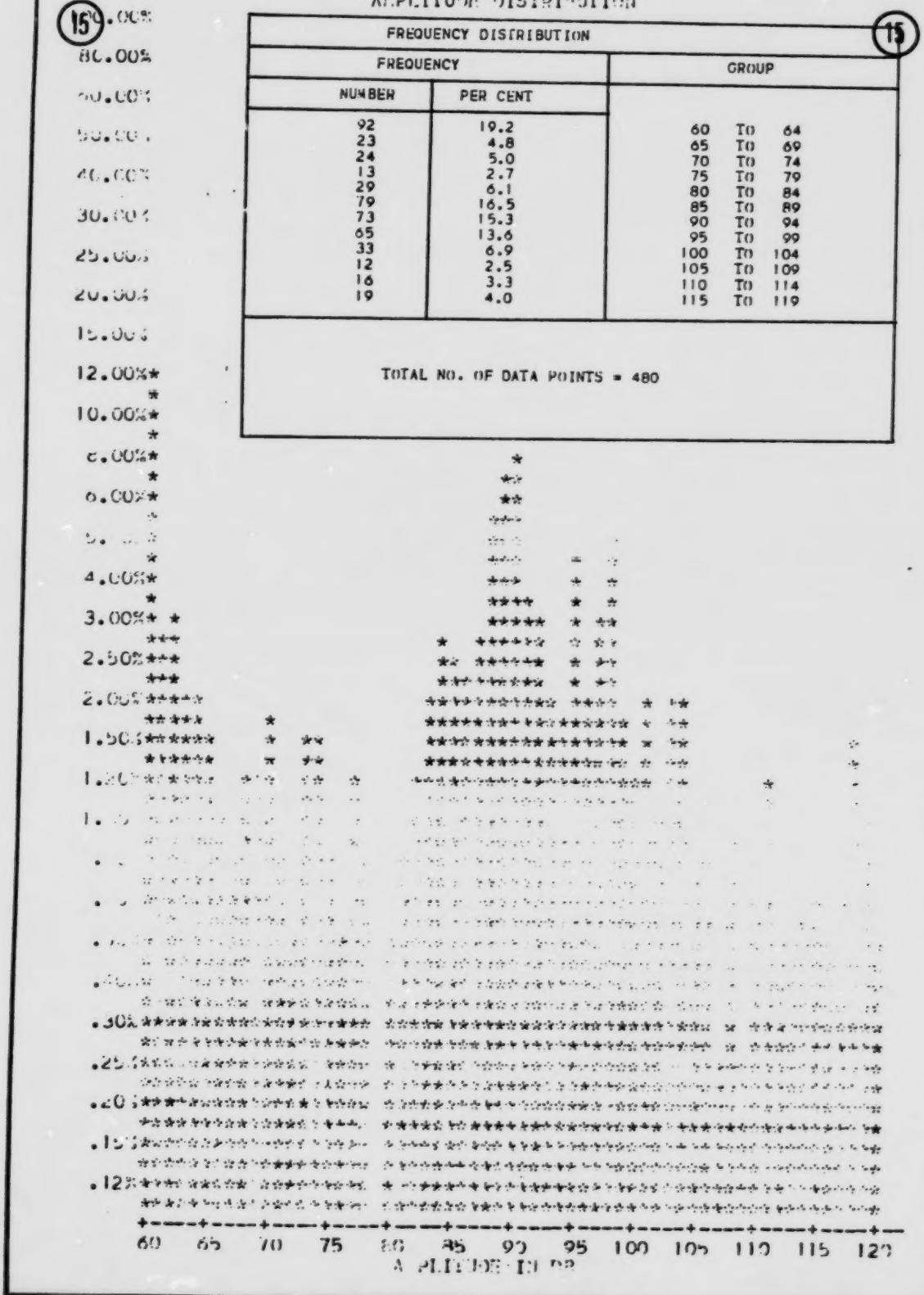
AVG. COMP. = 60 DB MAX. COMP. = 120 DB
AVG. SIG. [illegible] = 99.0%
SIG. [illegible] = 10.2
VARIANCE = 25.1 DB

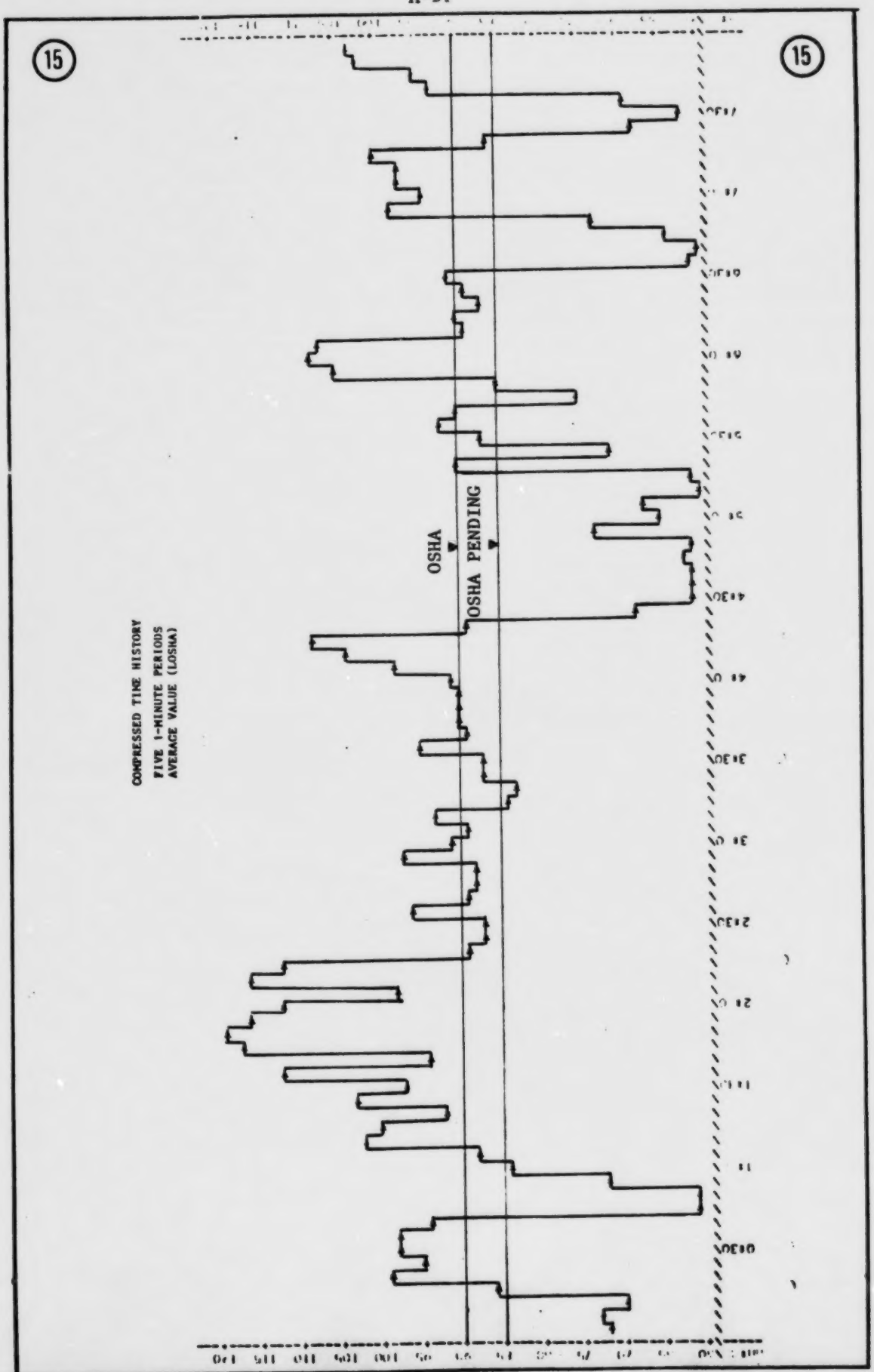
AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
92	19.2	60 TO 64
23	4.8	65 TO 69
24	5.0	70 TO 74
13	2.7	75 TO 79
29	6.1	80 TO 84
79	16.5	85 TO 89
73	15.3	90 TO 94
65	13.6	95 TO 99
33	6.9	100 TO 104
12	2.5	105 TO 109
16	3.3	110 TO 114
19	4.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




15
15
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

  1  26  80  1218    60    64     4     1
      75      11520  480
 61  61  60  61  60  60  61  62  62  62  60  62  66  60  61  60
 60  60  73  73  74  73  73  65  66  64  71  69  65  60  66  69
 61  63  60  63  60  60  60  60  62  66  65  74  75  67  76  71
 70  69  71  70  64  73  73  69  69  64  63  67  69  74  71  70
 71  77  84  84  75  75  67  70  75  70 101 100  67  76  69  66
 97  96  97  71  69  60  64  61  60  60  61  60  61  71  77  95
 90  83  83  83  85  85  85  84  83  83  86  93  96  94  95  98
100  97  95  97  95  97  97  97  94  96  95  97  97  97  94  87
 99  98  97  97  94  97  96  96  95  93  92  97  99  91  94  97
 98  97  98  96  97  94  96  98  98  98  98  96  99  97  96  96
 99  99  99  99 100  97  96  91  86  94  96  97 100  99  97  97
 97  98  96  96  97  95  97 101  97  91  90  87  87  87  83  88
 84  87  83  86  84  85  84  85  85  85  84  85  84  84  83  89
 84  84  84  84  83  86  86  87  87  87  88  87  95  96  86  92
 85  87  86  85  86  87  85  87  86  86  87  83  89  90  91  90
 92  92  89  87  89  87  84  89  90  94  85  84  84  84  86  85
 85  84  84  85  85  84  85  86  87  87  86  87  90  93  91  86
 91  94  93  94  85  84  84  86  87  85  87  86  86  88  95  92
 93  90  90  87  86  90  91  91  91  92  93  91  92  93  92  91
 90  92  90  87  87  95  91  85  93  89  91  93  93  90  87  95
 93  87  85  86  84  90  90  95  89  90  91  84  90  92  90  83
 85  91  90  91  84  82  83  83  83  83  84  85  84  85  84  84
 84  85  98  96  86  86  86  90  93  99  99  97  92  86  87  91
 97  99  97  96  98  95  95  96  99  98  97  96  93  93  72  60
 60  65  60  63  60  60  60  60  60  61  60  60  60  60  62  60
 60  60  60  60  60  71  60  60  60  60  60  61  60  72  68  91
 93  96  95  96  98  98  95  95  95  96  96  96  97  96  97  88
 70  85  60  60  60  89  94  85  93  78  72  66  77  64  66  86
 84  87  98 103  89  83  86  84  81  85  89  78  76  74  89  82
 81  87  90  73  77  79  66  60  62  79  83  75  75  83  61  61
EOF


ENTER LOG DATE (MM/DD/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC203
ENTER USER CODE (4 CHARS) : 4068
 ENTER JOB CODE (3 CHARS) : 270
```

```
    DATA LOGGED :12 JULY 1979          DATA ANALYZED : 12 SEPT 1979
        LOCALE : E-301/26                  SITE CODE : CC203
SERIAL NUMBER : 1214                        JOB CODE : 270
       LABELLED : 60 Hz                    USER CODE : 4068
DYNAMIC RANGE : 96 dB                      TRIGGER(L) : 60 Hz
SAMPLING RATE : 4/SEC                   TOTAL SAMPLES = 11520
 TEST DURATION = 48 MIN                  STANDBY TIME =  0 MIN
```

TIME HISTORY ANALYSIS

```
ACTIVITY SEVERITY INDEX (A.S.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
LOG LOGIC = 20 LOG X + 60
SAMPLING (SAMPLING) RATE = 4 Hz
THRESHOLD (TRIGGER) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 440
PERIOD = 1 MINUTES

TIME          LOGA                        LOGV
HOUR    CUMULAT   CUMULATIVE        CUMULAT   CUMULATIVE
   1      81.2        81.2          3.499        3.50
   2      92.5        86.9         17.677       21.18
   3      97.0        92.7         33.006       54.18
   4      88.5        91.5         11.127       65.31
   5      89.7        91.3         10.637       75.95
   6      89.6        91.1         11.760       87.71
   7      90.1        91.0         12.588      100.30
   8      94.0        91.7         10.324      110.62
TIME COMP. = 60 MIN                MAX. COMP. = 104 DB
ANALYSIS TIME = 48 MIN
SAMPLE EXCEEDANCE = 12
ACTIVITY TIME
```

AMPLITUDE DISTRIBUTION

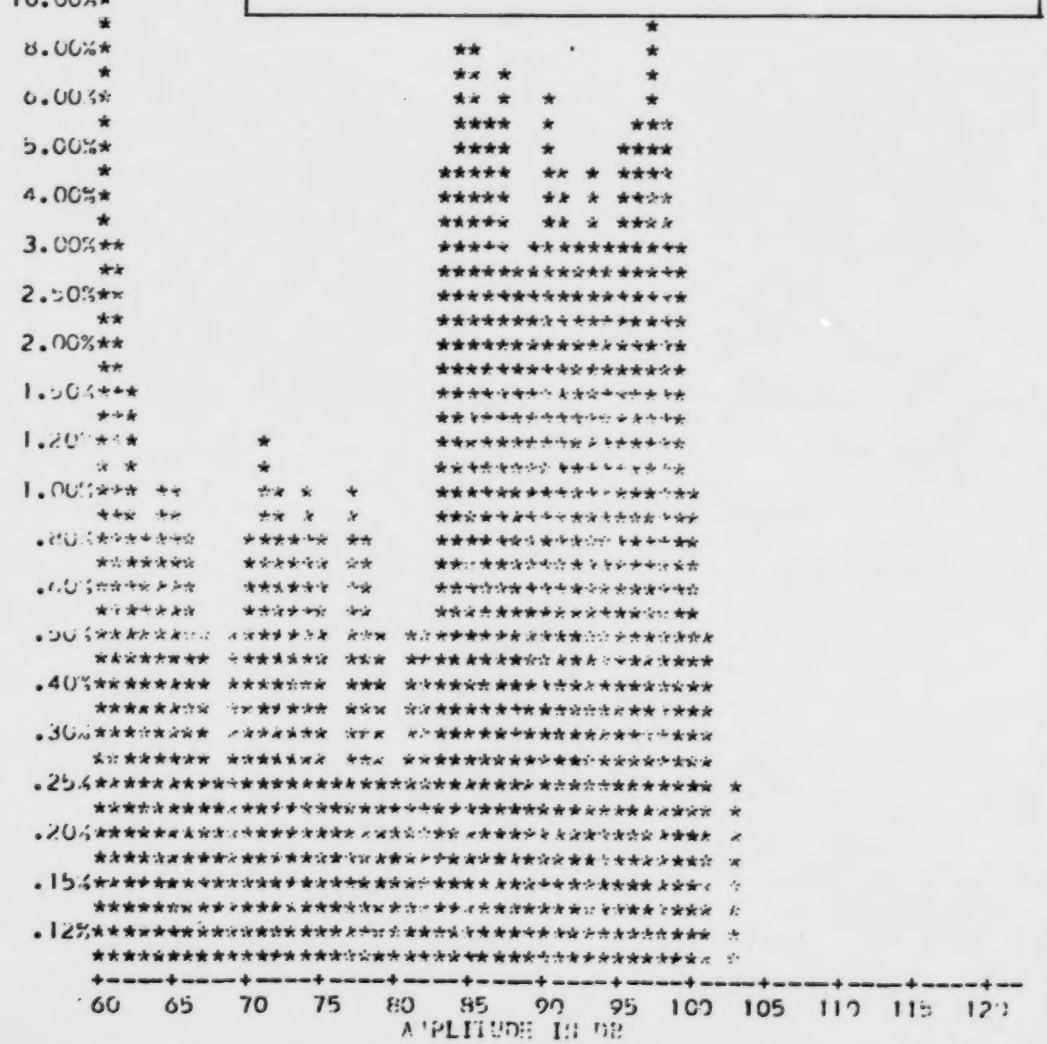
16

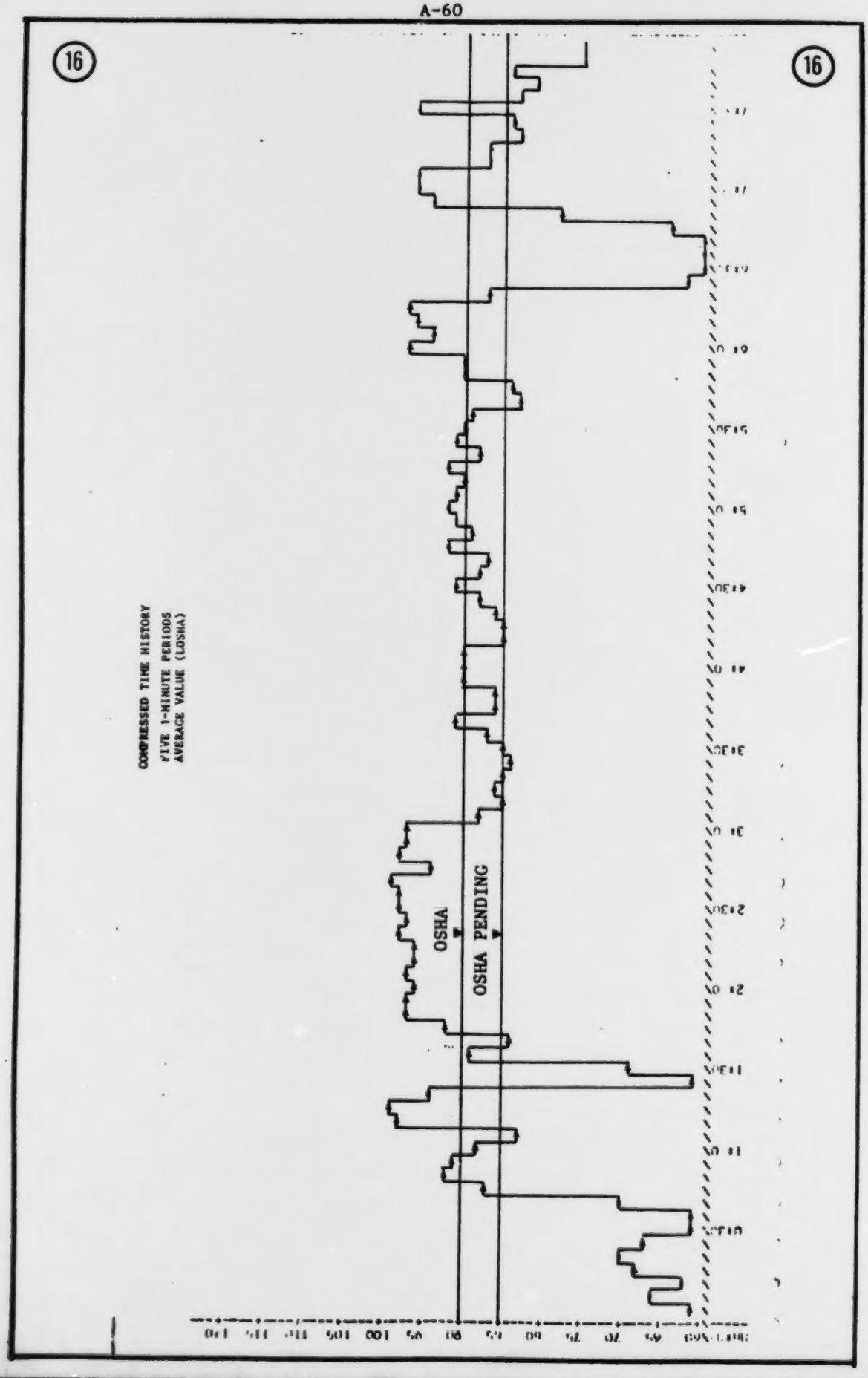
FREQUENCY DISTRIBUTION

16

FREQUENCY		GROUP
NUMBER	PER CENT	
73	15.2	60 TO 64
12	2.5	65 TO 69
19	4.0	70 TO 74
13	2.7	75 TO 79
54	11.3	80 TO 84
106	22.1	85 TO 89
84	17.5	90 TO 94
112	23.3	95 TO 99
7	1.5	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




16
16
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(17)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

1 26 80 1216 60 64 4 1

159 115200 480

67	62	60	60	60	60	62	60	61	63	61	60	62	77	60	60
63	61	64	62	62	60	64	60	60	60	60	60	60	65	67	75
79	71	90	92	95	94	92	92	93	93	92	93	100	103	101	102
101	104	103	99	94	94	83	61	60	60	60	60	60	60	60	60
63	73	91	91	91	92	95	92	93	94	90	88	64	64	61	62
84	81	90	95	95	93	89	91	91	91	94	94	94	94	95	99
95	96	99	94	101	91	85	85	83	83	83	84	84	85	84	83
84	83	83	85	85	85	85	83	83	85	86	84	84	83	84	84
84	84	86	84	84	83	84	84	84	83	85	85	86	84	84	84
84	83	83	85	84	83	83	83	85	84	85	85	85	83	82	83
83	84	84	85	84	83	85	87	97	99	96	97	95	93	86	80
83	84	80	79	83	86	85	75	69	72	85	86	79	75	80	78
83	74	72	70	65	83	83	84	83	84	84	84	84	82	83	82
81	82	82	82	85	91	94	97	99	95	95	97	96	91	88	93
95	95	95	93	95	94	94	96	97	91	95	96	97	101	100	98
74	74	83	84	85	83	83	85	83	88	95	83	89	82	93	94
75	74	70	77	76	70	67	60	60	71	76	76	78	79	77	74
64	65	60	60	62	65	61	60	62	61	61	60	65	65	62	66
67	62	64	77	76	60	60	63	93	81	78	88	74	66	82	76
70	67	67	70	89	73	68	90	78	98	89	91	87	73	90	90
73	94	93	64	88	71	90	86	79	81	80	81	81	80	79	84
75	76	77	75	70	76	81	79	84	79	75	69	77	80	81	82
80	80	79	73	80	77	73	76	65	79	88	79	89	90	90	91
89	92	90	90	107	84	60	60	60	68	60	60	72	69	60	63
80	90	82	83	82	89	89	95	98	98	96	97	95	89	94	99
96	94	96	96	92	91	94	83	80	86	85	81	82	66	67	66
64	60	73	68	70	63	64	64	65	63	72	63	71	70	79	76
66	70	72	67	79	73	68	71	63	95	102	94	67	60	60	60
60	60	60	60	60	60	66	60	60	60	60	60	60	64	61	68
89	94	93	94	95	95	95	97	81	80	80	80	80	61	62	63

ENTER LOG DATE (DD/MM/YR) : 16/07/79
ENTER SITE CODE (5 CHARS) : 00210
ENTER USER CODE (4 CHARS) : 4116
ENTER JOB CODE (3 CHARS) : 241

DATA LOGGED : 16 JULY 1979
LOGGER : [illegible]-301/20
SERIAL NUMBER : 1215
CABLING : [illegible]
DYNAMIC RANGE : [illegible]
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

DATA ANALYZED : 13 SEPT 1979
SITE CODE : 00210
JOB CODE : 241
USER CODE : 4116
[illegible]
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

[illegible] CALCULATIONS
ARE BASED ON THE FOLLOWING
[illegible]
[illegible]
[illegible]
[illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	[illegible]		[illegible]	
[illegible]	[illegible]	CUMULATIVE	[illegible]	CUMULATIVE
1	90.2	90.2	12.848	12.85
2	90.5	90.4	13.435	26.28
3	[illegible]	89.3	7.957	34.24
4	90.7	89.7	13.765	47.99
5	90.3	89.5	3.274	50.98
6	89.3	87.8	4.293	55.27
7	90.1	89.2	12.141	67.42
8	89.9	87.6	5.379	72.79

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 79.09
STD. DEVIATION = 13.95
VARIANCE = 194.86
MAX. COMP. = 107 DB

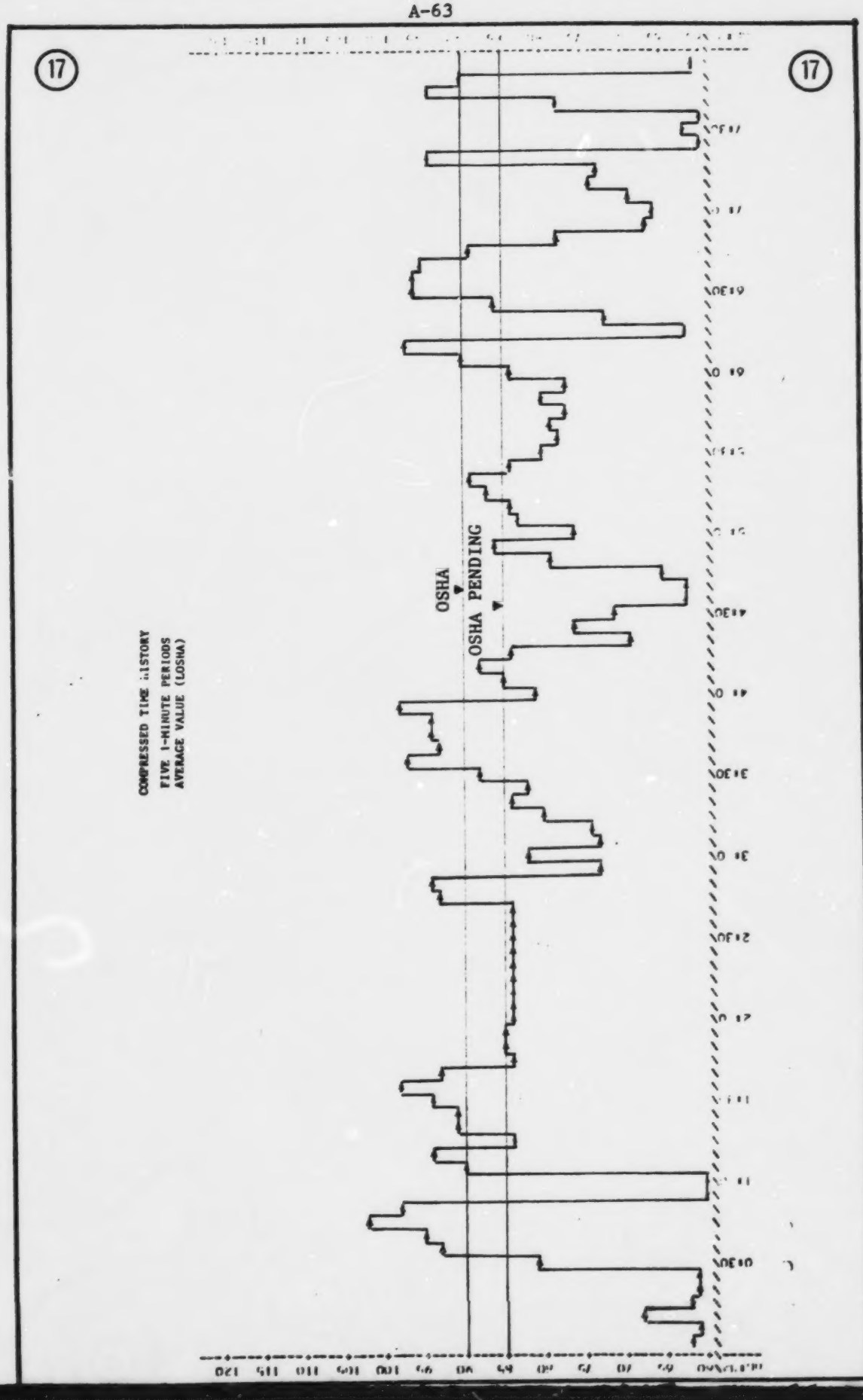
(17)

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
100	20.8	60 To 64
36	7.5	65 To 69
33	6.9	70 To 74
40	8.3	75 To 79
102	21.3	80 To 84
47	9.8	85 To 89
61	12.7	90 To 94
49	10.2	95 To 99
11	2.3	100 To 104
1	.2	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480

(17)


17
17
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(18)

PLACE TAPE IN LOWER TAPE UNIT A STANDARD TAPE A 556 BPI

```
 1  20  80  1220   60   64    4    1
      70      1152.0  4.0
 66  64  60  60  61  61  60  62  62  60  68  70  63  70  65  70
 66  62  69  70  77  71  69  70  79  85  82  81  93  94  93  93
 93  96  96 100  93  99 101  95  91  99  99  95  87  77  77  79
 70  73  84  75  82  82  84  85  73  85  75  80  82  75  81  77
 75  76  84  73  75  80  74  80  90  90  82  85  84  88  73  79
 75  81  77  80  76  76  69  66  65  60  71  71  88  90  89  89
 93  90  94  95  92  91  99 100  92  90  84  85  89  95  87  84
 81  85  87  92  80  86  93  86  86  87  97 100  95  86  92  92
 93  93  92  90  94  91  93  95  95  85  91  90  90 105 114 117
117 113 105  96  92  98  95  96  94  92  95  90  95  95  99  97
 95  92  92  92  93  92  94  91  87  85  87  86  86  85  86  85
 85  15  84  85  86  86  85  84  83  87  88  84   2  92  89  84
 83  83  84  86  85  85  82  82  82  82  82  83  83  86  87  84
 85  85  85  81  82  83  86  85  85  85  85  84  85  85  90  92
 91  85  87  86  89  91  86  90  87  81  91  96  97  92  99  95
 96  97 100 102  97 102 102 101 101 103 103 103 103 103 103 102 100
100 101  99  99 100 102 104 103  93  96  99  97  96  97 106 112
102  95  97  97  93  93  92  90  92  89  89  90  90  93  90  90
 90  90  90  90  90  90  90  90  90  91  90  90  91  90  91  91
 91  92  91  91  91  90  91  92  94  91  92  99 102 103 103 102
 93  88  92  91  83  87  90  90  83  87  87  91  88  80  89  87
 90  96  98  93  93  90  81  84  82  84  80  80  82  82  83  80
 83  84  83  83  87  81  82  85  83  80  81  80  80  80  83  83
 81  84  83  81  81  81  81  81  81  81  83  83  81  84  83  80
 80  90  90  91  95  98  96  84  81  92  95  95  90  80  80  81
 80  80  80  83  83  80  82  82  81  80  81  89  87  84  85  83
 83  88  95  95  95  95  95  95  95  95  95  95  95  95  96  96
 95  96  96  96  96  96  95  98  99  93  86  92 102  93  93  89
 96  87  79  80  79  76  81  82  74  77  84  95  93  95  92  91
 96  98  92  83  82  86  83  87  84  86  93  90  93  92  85  92
&EOF
```

(18)

```
ENTER LOG DATE (DD-MMM-YY) : 14OCT72
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4068
 ENTER JOB CODE (3 CHARS) : 270
```

(

```
    DATA LOGGED 13 JULY 1970                DATA ANALYZED : 12 SEPT 1972
        LOGGER : HP-3017/2B                     SITE CODE : CC210
 SERIAL NUMBER : 1220                           JOB CODE : 270
      BASELINE : 0.0                          USER CODE : 4068
DYNAMIC RANGE : 4.0                          RESOLUTION : 0.1
 SAMPLING RATE : 4750.0                   TOTAL SAMPLES =  11520.
 TEST DURATION =  60.0 SEC                STANDBY TIME =  0.0417
```

TIME HISTORY ANALYSIS

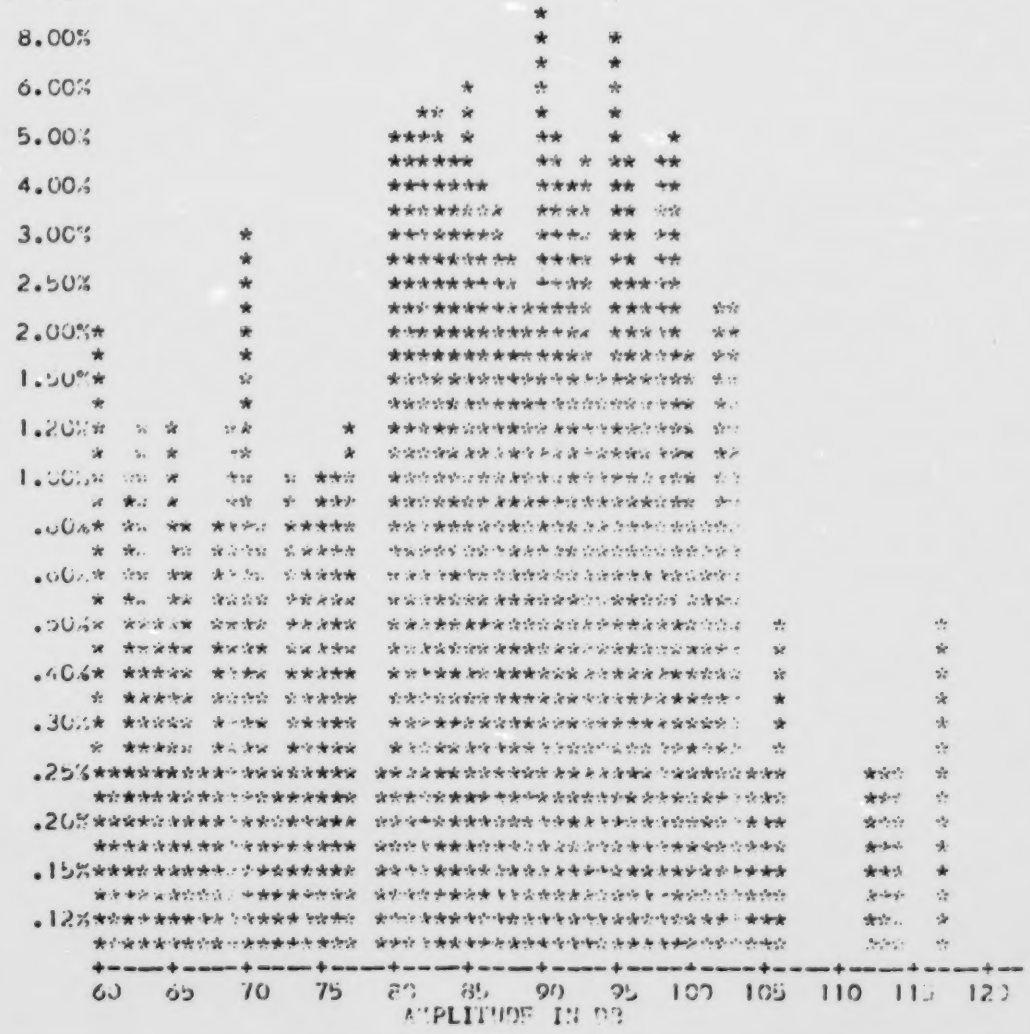
DOSE EXPOSURE INDEX (D.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
LOCK DOSE = 80 DB / 8 HOURS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

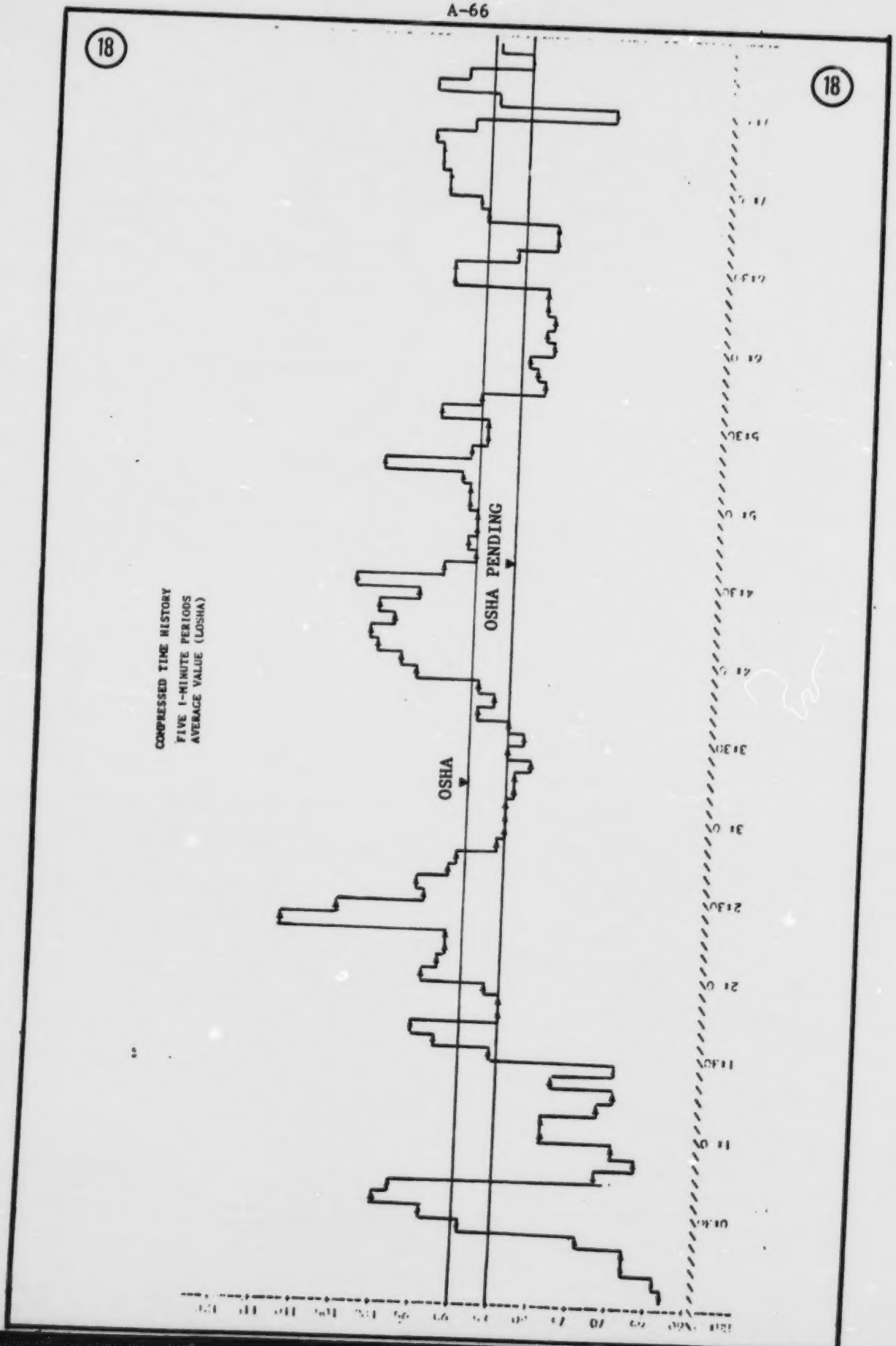
TIME	LOCK		MONITOR	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	7.0.0	7.0.8	10.513	10.51
2	85.0	87.4	7.313	17.82
3	92.0	93.1	0.0.3	00.00
4	87.0	93.0	9.170	7.0.57
5	9.0.0	94.6	42.321	117.70
6	92.0	9.0.2	16.415	133.55
7	87.3	93.5	8.033	142.27
8	93.0	93.5	19.928	162.20

MIN. CONF. = 00.0B MAX. CONF. = 117.0
ALTERNATE SEA = 87.00
ALT. LEVIATION = 12.0
ALT. CONF. = 81.0

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
20	4.2	60 TO 64
17	3.5	65 TO 69
23	4.8	70 TO 74
14	2.9	75 TO 79
104	21.7	80 TO 84
77	16.0	85 TO 89
95	19.8	90 TO 94
93	19.4	95 TO 99
29	6.0	100 TO 104
3	.6	105 TO 109
3	.6	110 TO 114
2	.4	115 TO 119

TOTAL NO. OF DATA POINTS = 480




18
18
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(19)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1224   60   64    4    1
     93      11520  480
  73  61  60  60  60  65  63  60  61  60  60  60  62  65  72  83
  76  74  89  90  93  95  94  93  100 102 101 101 99  97  100 96
  99  95  88  88  83  80  80  80  80  80  80  80  84  80  80  80
  89  91  93  94  90  92  90  90  92  91  90  89  90  98  96  91
  86  83  81  86  86  86  84  83  82  82  82  82  84  91  82  82
  82  87  83  87  87  82  82  80  79  1   85  86  1   93  87  93
  97  86  103 97  97  96  83  72  73  79  84  81  78  72  77  76
  73  79  85  79  85  87  94  96  93  80  76  87  95  90  94  88
  97  98  89  90  94  97  101 96  102 97  98  88  93  98  95  101
  96  87  87  82  83  85  85  86  83  85  85  86  85  1   1   1
  87  87  87  87  87  89  96  104 105 103 103 105 104 101 103 111
 104 100 97  104 105 105 105 106 105 104 103 103 103 103 104 103
 103 103 103 102 101 99  98  96  95  99  98  93  93  92  102 105
 102 103 103 103 103 103 104 104 103 103 104 104 105 104 104 105
 104 104 103 102 102 102 103 103 103 103 104 103 103 104 104
 103 101 102 104 103 103 101 100 101 97  96  84  86  80  80  80
  80  80  80  80  80  80  70  72  62  80  80  80  83  87  85  83
  80  80  80  80  73  81  80  80  80  87  91  93  101 104 108 105
  90 103  99  92  86  94  96  86  86  87  88  87  88  90  91  93
  94  85  85  93  88  87  77  73  73  72  78  89  79  80  93  78
  81  80  78  82  82  83  83  82  82  81  82  83  86  83  82  85
  82  81  83  82  82  82  82  80  81  81  82  82  82  83  84  83
  82  82  82  82  83  83  82  83  83  83  82  84  86  86  87  84
  82  82  82  83  81  82  83  82  82  82  83  106 100 93  83  83  84
  86  87  81  91  90  78  75  77  72  73  76  84  93  89  89  90
  96  98  97  99  97  99  100 100 100 96  98  96  93  97  97  96
  97  91  80  76  85  89  91  93  95  95  94  95  93  90  95  92
 100  97  98  94  92  91  91  82  89  86  80  80  80  80  70  81
  80  80  75  90  99  93  92  90  97  98  104 106 102 87  84  83
  86  82  81  81  82  82  83  81  82  87  88  72  79  82  82  88
%EOF
```

(19)

```
ENTER LOG DATE (DD/MM/YR) : 17/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4116
 ENTER JOB CODE (3 CHARS) : 281
```

```
   DATA LOGGED :17 JULY 1979
        LOGGER : DE-301/20
SERIAL NUMBER : 1224
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   [illegible]

DATA ANALYZED : 13 SEPT 1979
    SITE CODE : CC210
     JOB CODE : 281
    USER CODE : 4116
    THRESHOLD : [illegible]
TOTAL SAMPLES =  11520
 STARTING AT  =  [illegible]
```

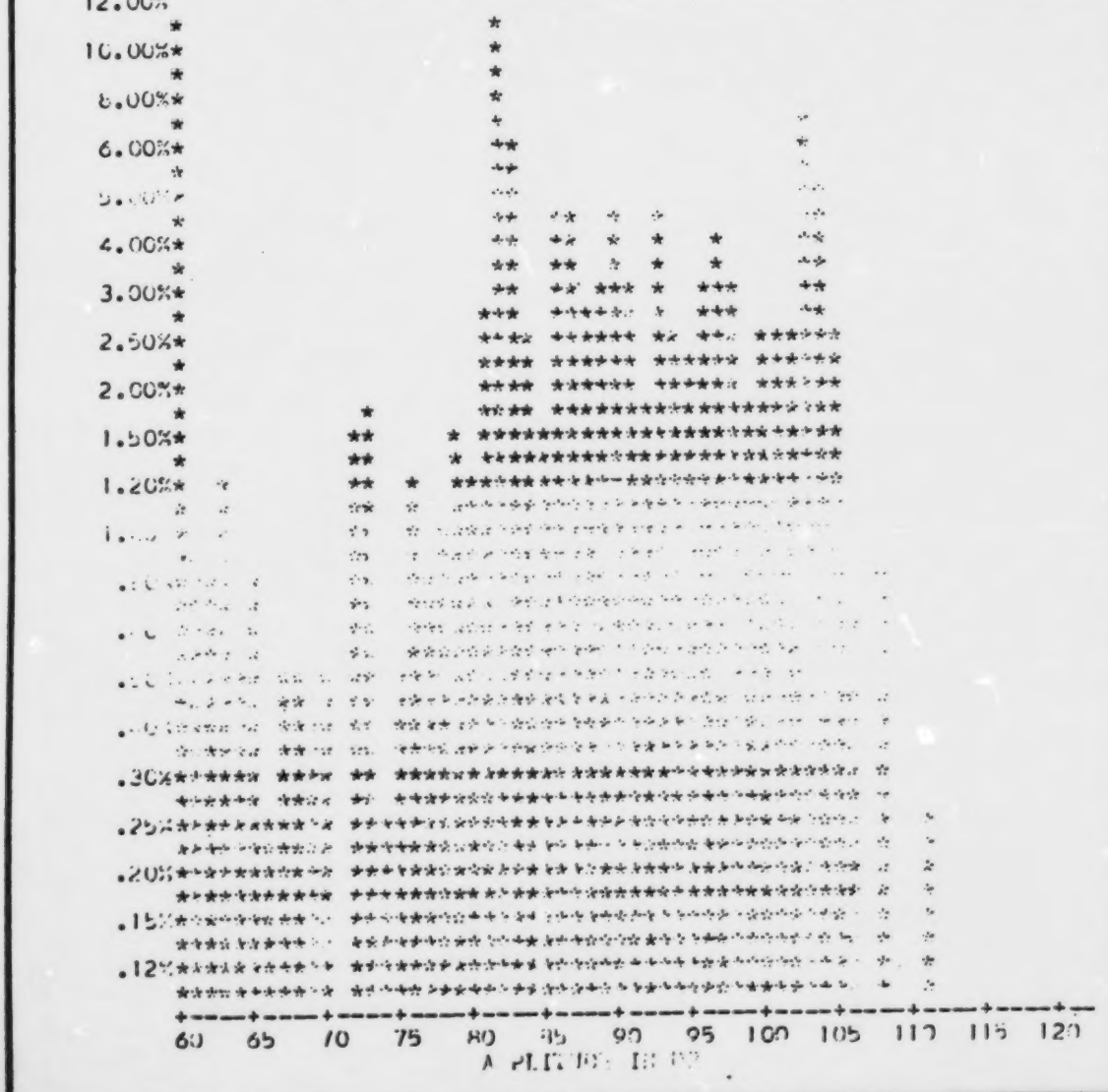
TIME HISTORY ANALYSIS

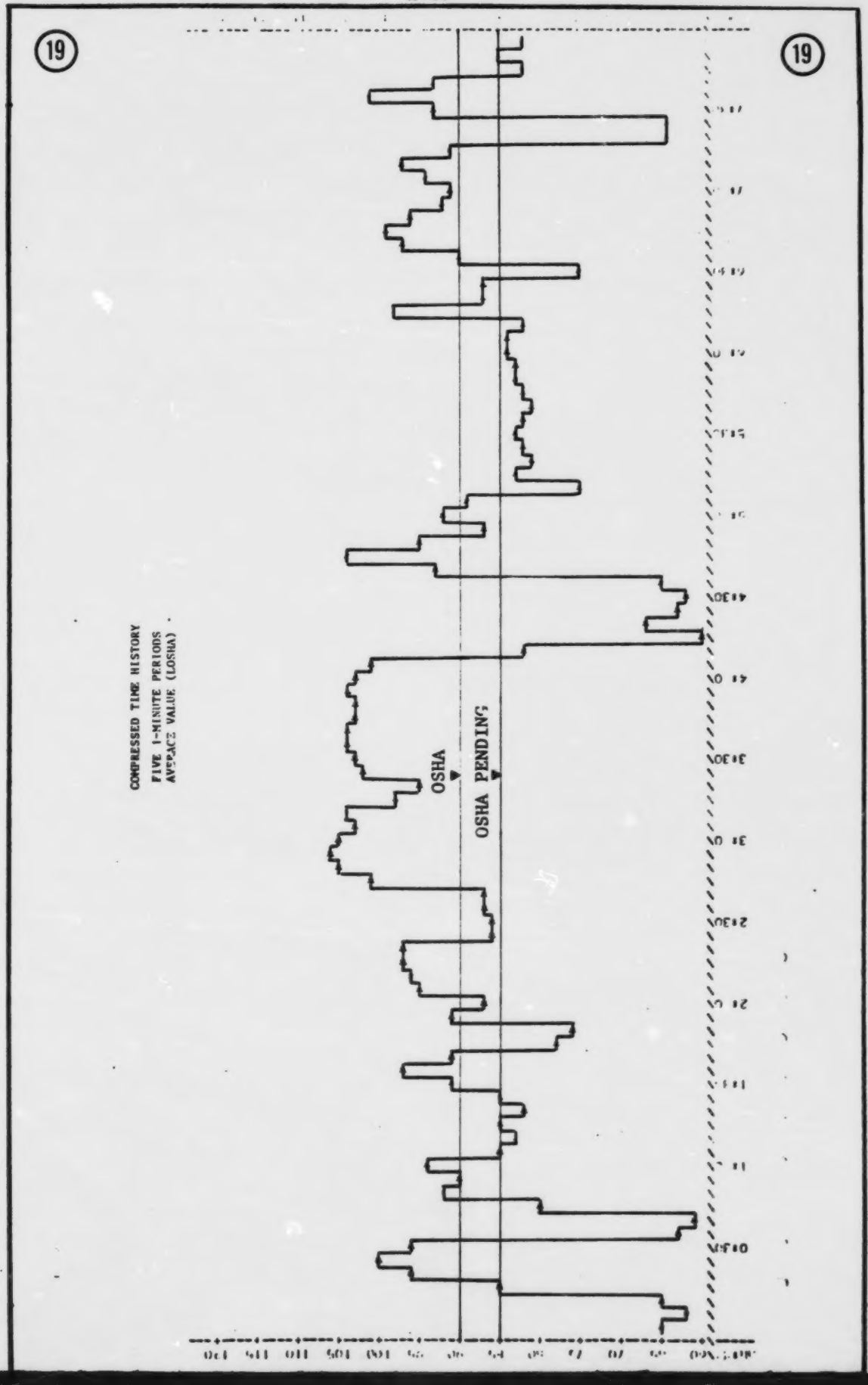
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
LOG STEP = 10 DB / 1 SEC
EXCHANGE (CONSTANT) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME HOUR	LOCAL CURRENT	LOCAL CUMULATIVE	NEPA CURRENT	NEPA CUMULATIVE
1	89.9	89.9	12.394	12.39
2	94.9	93.5	10.801	23.19
3	91.6	93.3	[illegible]	[illegible]
4	102.7	97.0	13.430	131.[illegible]
5	94.2	96.5	22.377	154.22
6	84.1	94.5	5.503	159.72
7	92.3	94.1	17.1[illegible]	176.90
8	91.7	94.7	15.[illegible]	192.76

MIN. COMP. = 60 DB MAX. COMP. = 111 DB
ARITHMETIC MEAN = 96.38
STD. DEVIATION = 13.[illegible]
VARIANCE =184.[illegible]

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP (19)
NUMBER	PER CENT	
58	12.1	60 TO 64
10	2.1	65 TO 69
16	3.3	70 TO 74
20	4.2	75 TO 79
98	20.4	80 TO 84
64	13.3	85 TO 89
63	13.1	90 TO 94
56	11.7	95 TO 99
78	16.3	100 TO 104
16	3.3	105 TO 109
1	.2	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




19
19
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(20)

PLACE TAPE IN READER WITH TYPE A "SPACE" AND A "RETURN"

(20)

```
 1  26  80  1213    40    44     4     1
   170     1152(40  4-0)
 75  60  60  60  60  60  60  60  60  45  76  76  66  79  93  90
 93  93  93  93  96 100  98  97  95  95  97  87  60  60  60  60
 70  93  80  60  61  62  60  60  60  73  92  64  73  75  79  81
 62  60  60  60  73  77  67  60  65  60  71  94  73  71  73  60
 60  63  70  62  81  60  60  60  76  77  71  60  60  92  87  85
 [illegible]
 [illegible]
 91  [illegible]  93  94  94  91  95  95  96  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 84  84  70  62  63  63  84  70  79  97  72  76  73  74  [illegible]  [illegible]
 [illegible]
 [illegible]
 84  87  95  90  93  93  83  84  83  92  94  81  70  80  75  [illegible]
 [illegible]
 [illegible]
 80  85  84  80  82  83  83  85  96  91  88  86  82  83  83  83
 82  82  83  83  83  84  95  88  94  94  95  92  86  82  83  83
 91  94  93  96  81  60  60  60  [illegible]  [illegible]  62  60  60  60  63  72
 60  60  60  60  60  64  60  60  60  60  63  60  60  60  60  60
 60  63  63  64  97  94  72  85  92  73  70  77  80  80  81  84
 81  81  80  88  83  85  89  84  73  75  74  74  81  89  95  84
 [illegible]
 99  99  99  112  109  103  95  94  109  99  70  72  74  80  82  81
 60  60  60  82  68  79  71  79  80  73  86  74  69  76  75  84
 70  69  70  85  81  60  60  60  84  96  98  96  98  96  87  80
 90  109  97  81  81  95  93  88  74  100  97  89  84  94  96  95
 91  95  97  93  91  76  73  83  81  82  80  82  80  80  83  89
 97  72  60  63  72  90  76  80  80  80  70  94  97  83  83  80
 60  91  92  88  80  72  82  82  97  92  87  90  80  94  89  85
 72  75  77  70  69  64  81  80  81  80  70  83  73  77  82  75
 93  103  95  87  83  72  91  97  89  90  87  95  101  103  97  93
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) = 17/07/79
ENTER SITE CODE (5 CHARS) = CC213

ENTER USER CODE (4 CHARS) = 4923

 ENTER JOB CODE (3 CHARS) = 241
```

```
   DATA LOGGED =17 JULY 1979          DATA ANALYZED = 13 SEPT 1979
      [illegible] = [illegible]          SITE CODE = CC213
SERIAL [illegible] = 1213                JOB CODE = 241
      [illegible] = [illegible]          USER CODE = 4923
DYNAMIC [illegible] = [illegible]        [illegible]
BAROMETRIC [illegible] = 29.[illegible]  TOTAL SAMPLES = 1152.00
ROOT [illegible] = [illegible]           STANDARD [illegible]
```

```
          SITE HISTORY ANALYSIS

[illegible] INPUT DATA (L.E.L.) CALCULATIONS
[illegible]
[illegible] = [illegible]
[illegible]
MINIMAL (CLIMAX) LEVEL = [illegible]
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 YEARS
```

YEAR	[illegible] CURRENT	[illegible] CUMULATIVE	[illegible] CURRENT	[illegible] CUMULATIVE
1	59.7	59.7	6.863	6.86
2	[illegible]	[illegible]	4.354	11.21
3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	12.309	32.18
5	66.2	[illegible]	6.416	38.60
6	97.8	98.1	38.990	75.59
7	99.1	99.2	13.829	89.41
8	[illegible]	99.9	10.747	100.16

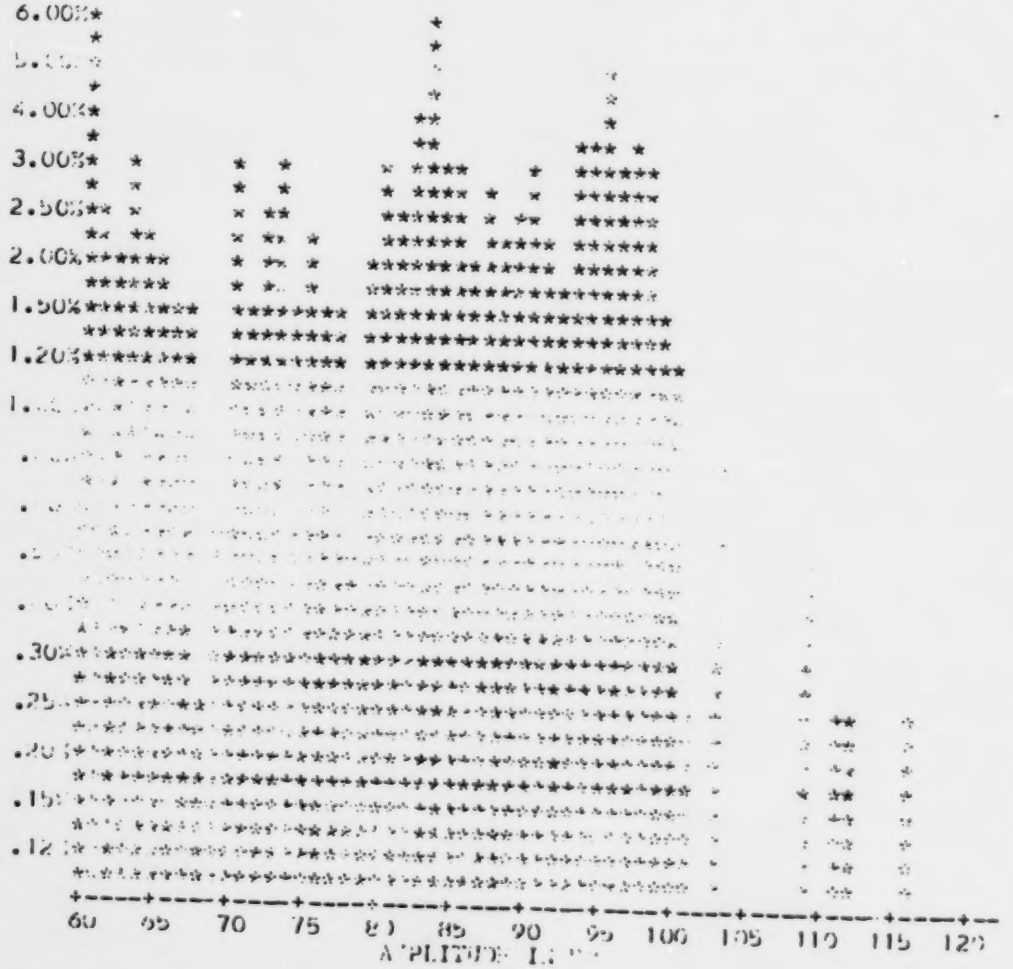
MIN. COMP. = 60.00 MAX. COMP. = 116.00
ANTHROPIC [illegible] = 79.00
SITE [illegible] = 14.00
VALIDATE =196.00

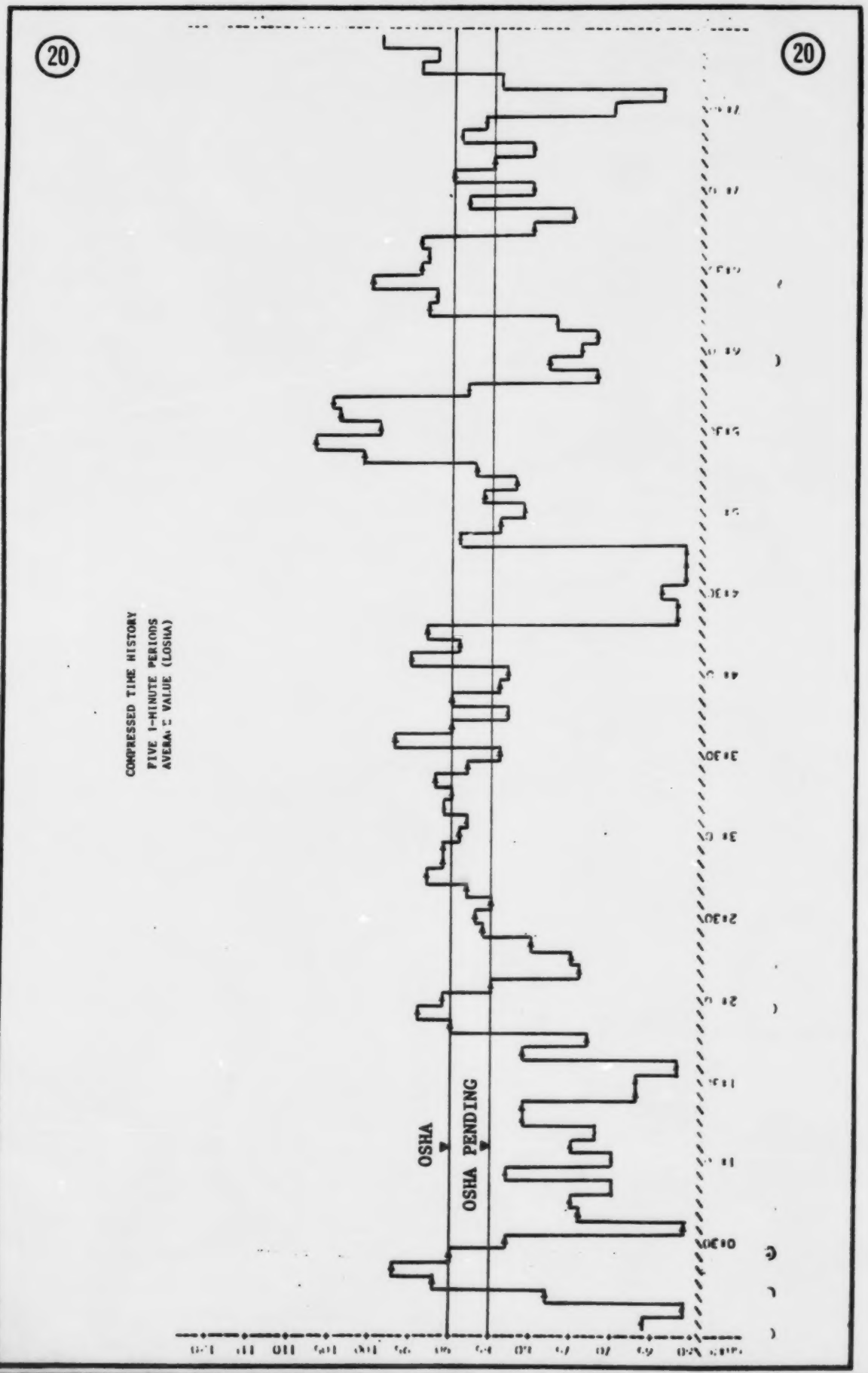
20

AMPLITUDE DISTRIBUTION

20

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
114	23.8	60 To 64
24	5.0	65 To 69
46	9.6	70 To 74
31	6.5	75 To 79
76	15.8	80 To 84
51	10.6	85 To 89
58	12.1	90 To 94
64	13.3	95 To 99
10	2.1	100 To 104
3	.6	105 To 109
2	.4	110 To 114
1	.2	115 To 119
TOTAL NO. OF DATA POINTS = 480		




20
20
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
OSHA
OSHA PENDING

(21)

```
PLAC  TAPE I  ...  ...  ...  TYP  I  PROMPT AND S  ...
  1  76  59  121  ...  ...  2  1
      28     1152(9)  4.0
  63  67  60  63  61  60  60  60  62  60  61  64  72  60  60  60
  60  60  60  60  60  60  60  60  61  60  60  61  61  60  60  62
  66  73  60  72  85  91  91  92  91  91  91  91  91  91  99  99
  98  96  97 101  97  79  62  60  60  60  60  62  60  60  60  66
  63  60  60  60  60  60  60  60  60  60  60  60  60  60  60  67
  66  60  71  77  73  64  65  66  65  65  65  64  75  69  69  72
  64  61  64  62  60  63  66  66  61  60  60  60  60  60  62  60
  60  60  90  95  60  60  60  60  62  60  67  69  94  96  92  81
  79  78  70  67  69  76  76  96  96  65  60  60  60  60  61  61
  66  60  66  70  94  97  94  94  84  80  60  61  70  60  60  67
  93  94  96  96  87  71  72  75  72  66  75  89  93  93  89  82
  60  60  66  68  64  70  64  64  73  60  62  60  60  60  60  60
  60  60  60  60  60  60  83  85  81  65  91  94  90  74  70  63
  70  64  81  60  77  74  60  70  70  61  60  60  96  96  94  91
  92  92  93  93  89  78  61  60  64  65  76  66  68  62  92  94
  96  82  60  80  95  78  65  60  83  75  95  94  95  95  95  94
  89  94  96  80  80  73  60  60  60  70  94  93  96  94  96  97
  91  84  75  60  60  60  60  75  95  95  98  92  91  93 100  91
  93  87  87  87  81  95  66  60  63  60  63  60  60  60  60  60
  60  50  60  60  60  60  68  60  60  60  60  60  69  64  60  67  60
  64  64  93  97  95  84  60  86  91  60  90 100 101 101 101  99
  96 101 100  99  97  98  98  92  92  90  85  60  60  62  65  60
  94  92  92  93  92  90  70  69  72  70  66  80  74  67  71  78
  89  95  91  90  97  96  96  97 101  99 100 100  95  96  95  95
  89  93  96  94  93  91  95  93  95  93  85  90  87  93  95  95
  90  80  80  60  77  95  93  98  93  91  91  94  87  93  94  92
  60  92  92  95  70  78  66  65  60  60  72  92  97 100  92  87
  86  94  93  89  89  73  83  88  92  89  93  90  99  94  95  90
  96  65  65  82  94  95  84  84  61  62  67  60  69  67  80  95
  98  91  90  96  85  90  86  96  95  81  61  63  60  60  60  64
END
```

(21)

```
ENTER LOG DATE (DD/MM/YR) = 16/01/19
ENTER SITE CODE (5 CHARS) = CC210
ENTER USER CODE (4 CHARS) = 3023
 ENTER JOB CODE (3 CHARS) = 241
```

```
U

      DATA LOGGED: 16 JULY 1979                DATA ANALYZED = 12 SEPT 1979
 C         LOCATION = A-301/26                      SITE CODE = CC210
  INDIVIDUAL ...  = 3213                           ... CODE = 241
        ... LIST  = ...                            ... CODE = 3023
 AVAIL IC ... BY  = 4.0V                          ... = ...
  ... LOG ...     = 4/5 C                    TOTAL DATA ... = 1152 PTS
 FLOW  ... ...    = ... ...                  STANDBY TI ... = ... ... S
```

TIME HISTORY ANALYSIS

```
 ...  ... ... ... ... (...+1.) CALCULATION...
 ... ... ... ... ... ... I...
 ... ... ... = ... / ...
 ... ... ... ... ... ... = ...
 ... ... ... (...+1.) ... = ...
 ... ... (...+...) L ... = ... %
  ... ... OF SUPPRESSION = 4...
 ... = 1 ...
```

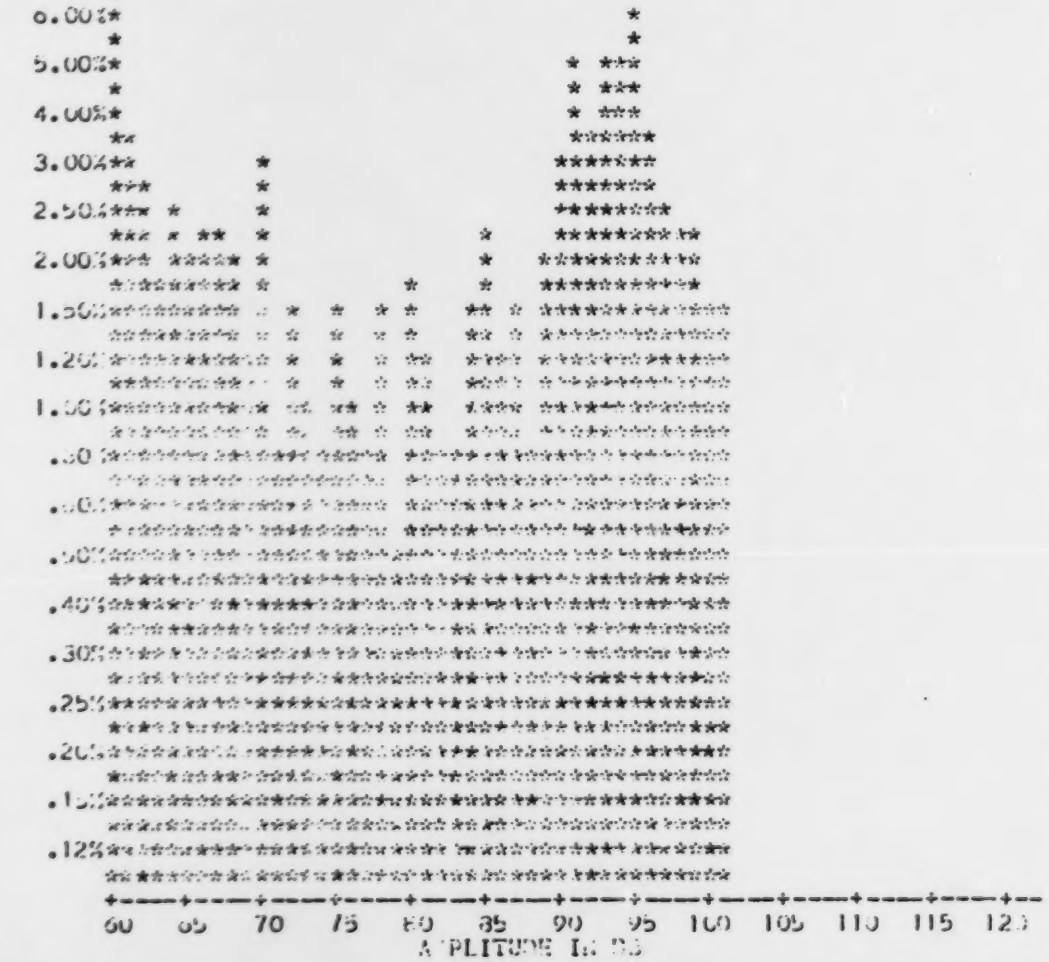
```
 ...          ...                          ...
 ...    ...  ...  ...  ...  ...  ...  ...  ...  ...
    1     ...     ...     ...     ...     ...
    2     ...     ...     ...     ...     ...
    3     ...     ...     ...     ...     ...
    4     ...     ...     ...     ...     ...
    5     ...     ...     ...     ...     ...
    6     ...     ...     ...     ...     ...
    7     ...     ...     ...     ...     ...
    8     ...     ...     ...     ...     ...
 ... ...  = ...          ... ... = ...
 ... ...  ... = ...
 ... = ...(...) = 1...
 ... ... = ...
```

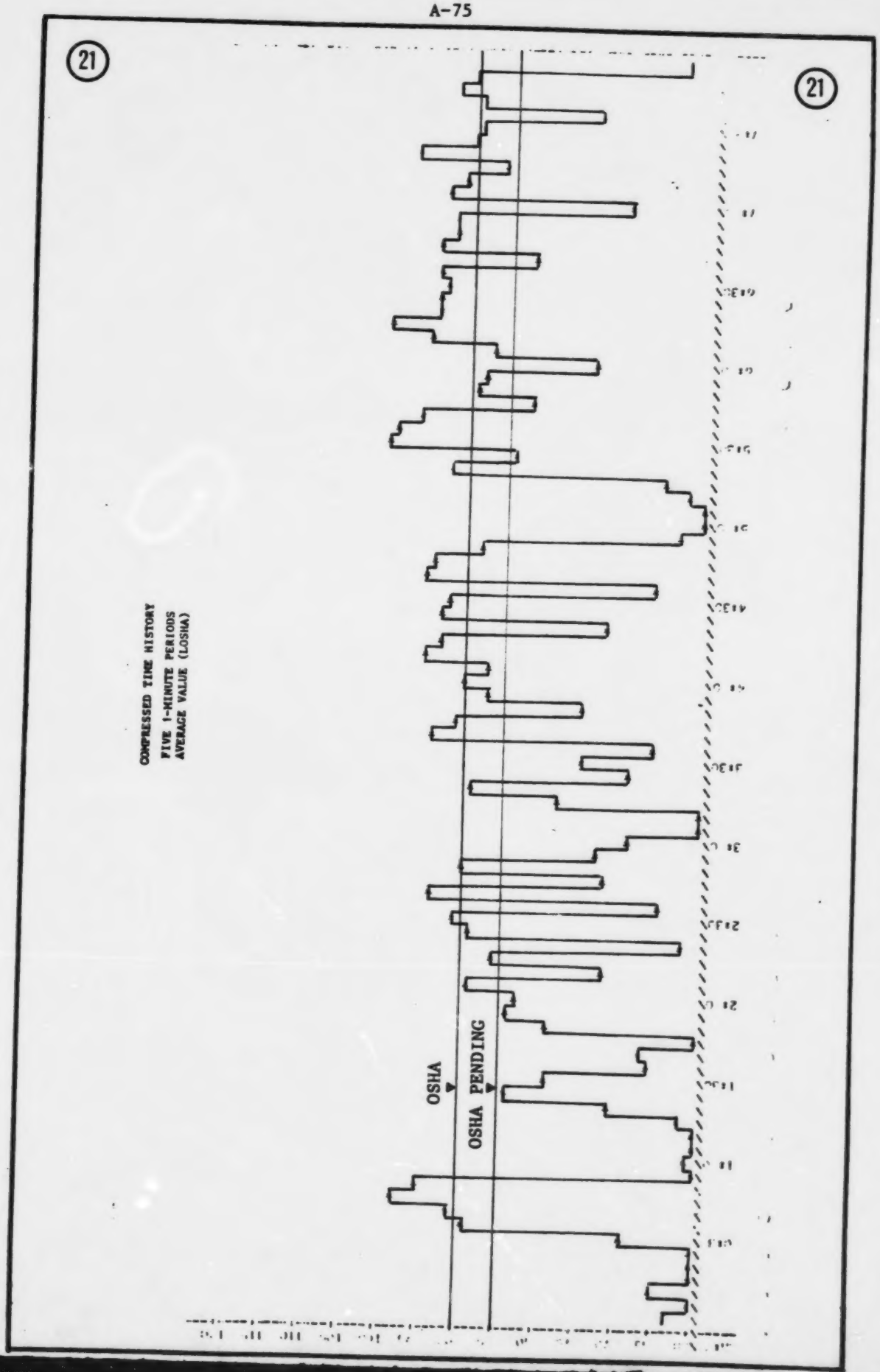
AMPLITUDE DISTRIBUTION

(21) (21)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
171	35.6	60 To 64
39	8.1	65 To 69
28	5.8	70 To 74
21	4.4	75 To 79
24	5.0	80 To 84
31	6.5	85 To 89
86	17.9	90 To 94
68	14.2	95 To 99
12	2.5	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




21
21
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

 1  26  80  1218   60   64    4    1
    369     115200  480

 66  69  60  60  66  71  69  68  61  60  60  69  65  71  63  60
 67  62  60  60  60  60  63  65  61  64  63  61  66  60  62  63
 67  60  64  65  60  60  60  64  62  60  67  88  93  91  93  97
 96  96  83  92  92  99  96  76  89  80  62  63  60  60  60  60
 60  60  60  62  60  71  75  72  63  61  60  60  60  60  66  60
 63  64  60  60  60  66  64  62  72  78  66  66  84  98  87  96
 93  91  95  96  97  95  98  96  83  94  98  79  86  91  86  74
 75  89  84  91  94  98  90  87  83  91  95  96  86  91  95  98
 94  89  90  92  87  87  94  83  86  94  94  86  87  95  90  94
 94  94  93  97  93  92 103 100  98  87  97  95 100  97 100  94
 91  96 102  99  97  94  94  98 101  99  97  97  98 102 101 107
 97 101  95  99 101 100 103  97  97  98  86  99  94 100  95  87
 93  93  96  96 101  99 102 101 100 103  92  77  96  90  62  66
 68  70  74  75  63  62  65  61  61  60  60  80  62  71  73  67
 62  84  91  73  92  96  97  92  96  96 100  94  95  97  99  98
 89  84  82  95  96  96  95  97 100  98  95  96  74  72  63  67
 67  60  68  65  61  61  64  60  60  60  63  60  60  61  67  63
 62  61  60  67  60  60  61  62  61  60  64  61  60  60  60  66
 61  63  62  66  71  60  61  62  61  65  67  61  63  60  68  68
 61  64  60  64  68  66  64  60  60  60  60  60  63  60  60  61
 60  60  60  60  60  60  60  60  60  60  65  60  60  60  60  60
 60  60  60  65  61  64  68  60  60  60  61  66  62  78  71  60
 60  60  60  60  60  60  60  65  71  60  60  60  60  60  68  60
 60  60  62  60  65  64  60  60  65  65  60  60  60  60  60  62
 60  60  74  68  86  75  76  77  62  60  61  84  75  60  60  61
 60  60  61  75  67  60  60  60  60  64  67  60  60  60  60  60
 69  73  66  64  67  60  60  80  75  70  65  80  74  63  64  79
 77  81  82  83  64  71  67  67  78  82  63  73  73  68  86  80
 69  67  76  69  60  79  62  79  79  60  64  87  74  82  75  77
 73  68  66  61  71  80  69  77  81  60  65  69  73  77  68  68
XEOF


ENTER LOG DATE (DD/MM/YR) : 15/08/79.
ENTER SITE CODE (5 CHARS) : ISH23

ENTER USER CODE (4 CHARS) : 7919
 ENTER JOB CODE (3 CHARS) : CDO


   DATA LOGGED :15  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : ISH23
 SERIAL NUMBER : 1214                     JOB CODE : CDO
      BASELINE : 60 DB                    USER CODE : 7919
 DYNAMIC RANGE : 64 DB                    THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 1:32

            TIME HISTORY ANALYSIS

 NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
 ARE BASED ON THE FOLLOWING:
 100% DOSE = 90 DB / 8 HRS
 EXCHANGE (DOUBLING) RATE = 5 DB
 THRESHOLD (CUTOFF) LEVEL = 80 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD =  1 MINUTES

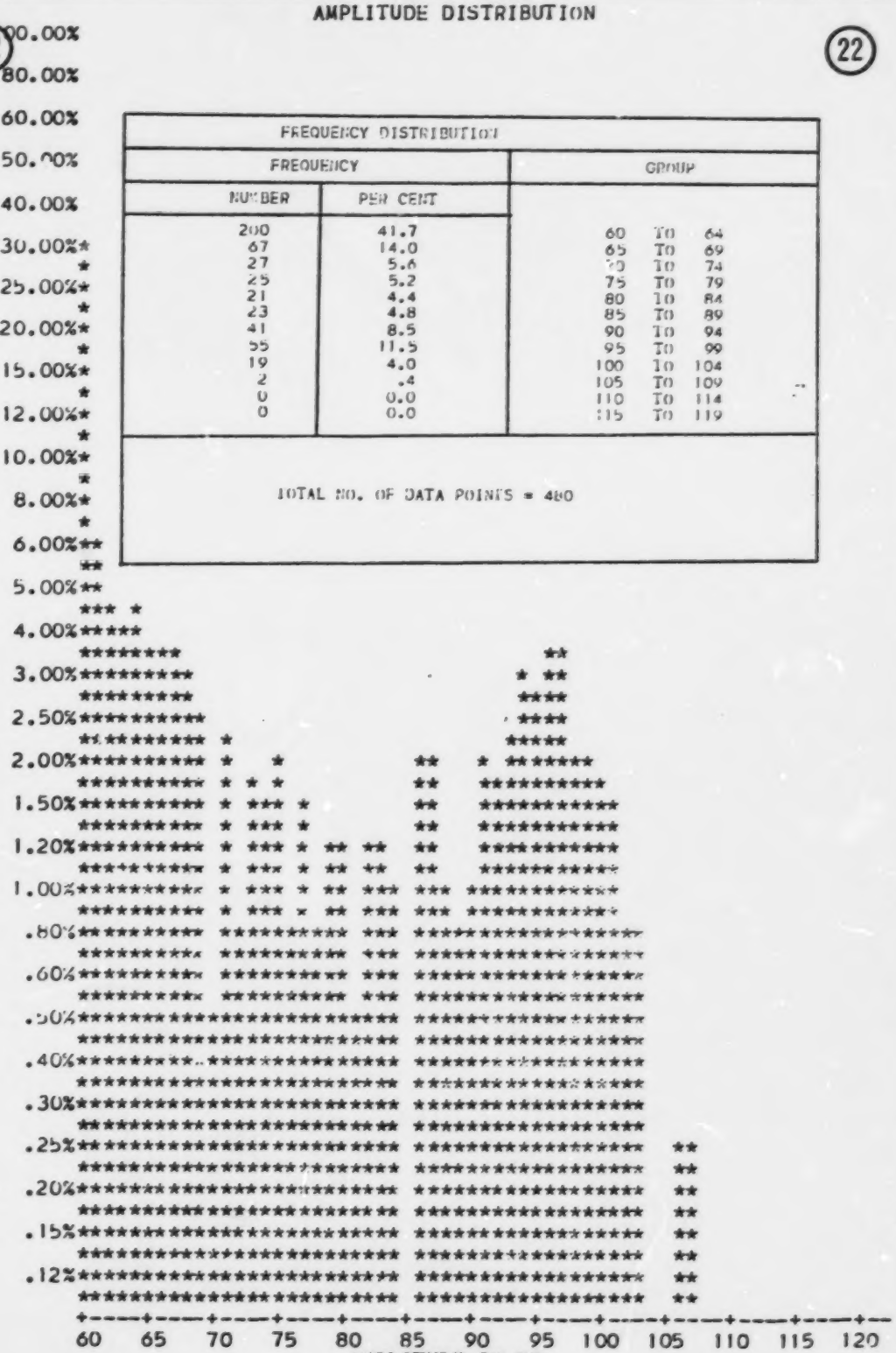
 TIME          LEQ/A                        DOSE
 HOUR     CURRENT  CUMULATIVE        CURRENT  CUMULATIVE
    1       82.9       82.9          4.674       4.67
    2       86.7       85.1          7.021      12.59
    3       90.4       90.9         30.164      42.76
    4       93.9       91.8         21.541      64.30
    5       83.8       90.8          5.312      69.62
    6       63.2       89.5           .304      69.92
    7       66.5       88.4           .631      70.55
    8       75.5       87.7          1.669      72.22
 MIN. COMP. =  60 DB                MAX. COMP. = 107 DB
 ARITHMETIC MEAN =  73 DB
 STD. DEVIATION =  15 DB
 VARIANCE =229 DB
```

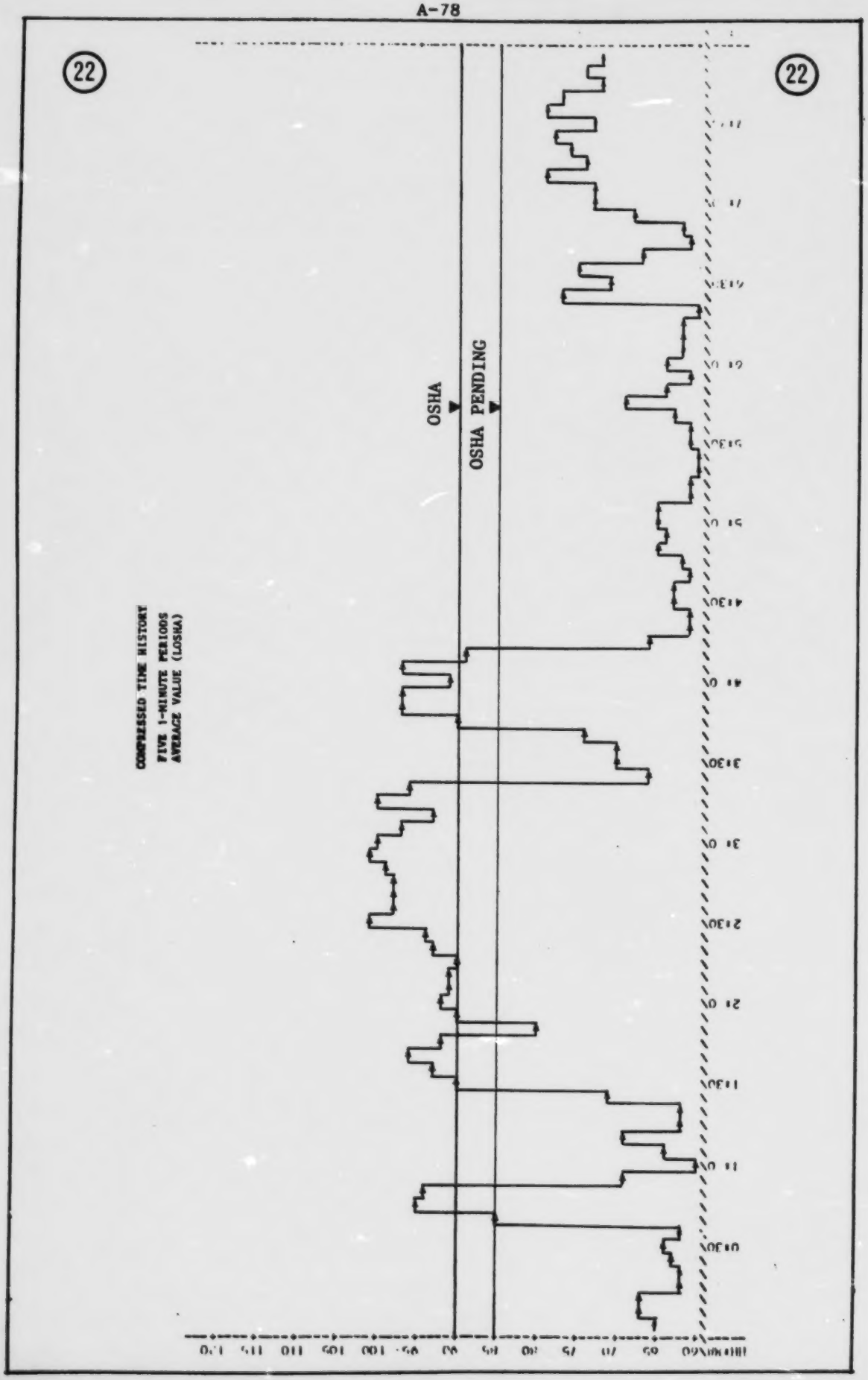
AMPLITUDE DISTRIBUTION

(22) (22)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
200	41.7	60 TO 64
67	14.0	65 TO 69
27	5.6	70 TO 74
25	5.2	75 TO 79
21	4.4	80 TO 84
23	4.8	85 TO 89
41	8.5	90 TO 94
55	11.5	95 TO 99
19	4.0	100 TO 104
2	.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




22
22
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
DB(A)
60
65
70
75
80
85
90
95
100
105
110
115
120

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225     60     64     4     1
     136     115200   480
 65  70  63  60  65  67  66  60  65  67  60  60  60  62  60  60
 61  62  60  60  60  60  60  60  61  61  60  62  65  63  66  60
 61  63  65  65  60  60  62  63  62  60  63  90  60  60  38  79
 77  83  60  60  60  73  61  64  68  60  64  62  60  60  60  60
 60  60  60  60  60  67  60  66  61  60  60  60  60  60  60  60
 60  60  63  60  60  66  60  60  60  60  79  60  67  67  60  60
 60  60  60  60  60  65  65  61  60  60  60  60  75  66  65  60
 61  75  60  60  71  72  60  62  69  60  60  60  72  60  60  60
 67  60  60  71  60  60  60  60  60  60  60  60  71  60  60  60
 60  60  67  70  60  60  71  60  60  60  60  60  60  69  60  60
 62  74  61  60  60  71  60  60  61  60  60  60  60  60  60  60
 60  68  72  60  70  60  60  60  60  60  60  60  60  60  60  72
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  73
 60  60  60  60  60  60  60  61  60  60  60  72  70  60  60  62
 66  73  60  60  60  60  60  67  73  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  62  70  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  61  64  60  60  60  60
 62  64  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  65  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  61  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  73  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  64  60  60  60  60  60
 60  65  68  76  65  60  60  60  64  60  84  84  89  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  70  60  60  67  60  76  74  60  60  60  67  67  60  60  64
 61  69  70  79  60  60  60  60  74  76  60  60  60  72  77  84
 78  60  78  60  60  63  74  77  81  64  60  69  91  87  63  60
 74  71  77  67  70  81  77  70  87  72  62  69  71  72  69  72
>EOF


ENTER LOG DATE (DD/MM/YR) : 15/08/79
ENTER SITE CODE (5 CHARS) : 15H23
ENTER USER CODE (4 CHARS) : 4078
 ENTER JOB CODE (3 CHARS) : CDO


   DATA LOGGED :15  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/2A                SITE CODE : 15H23
SERIAL NUMBER : 1225                       JOB CODE : CDO
      BASELINE : 40 DB                     USER CODE : 4078
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8 DAYS 0           STANDBY TIME =   0 0:34


          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TEST DOSE = 90 DB / 8 HRS
BACKGROUND (BASELINE) LEVEL = 40 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

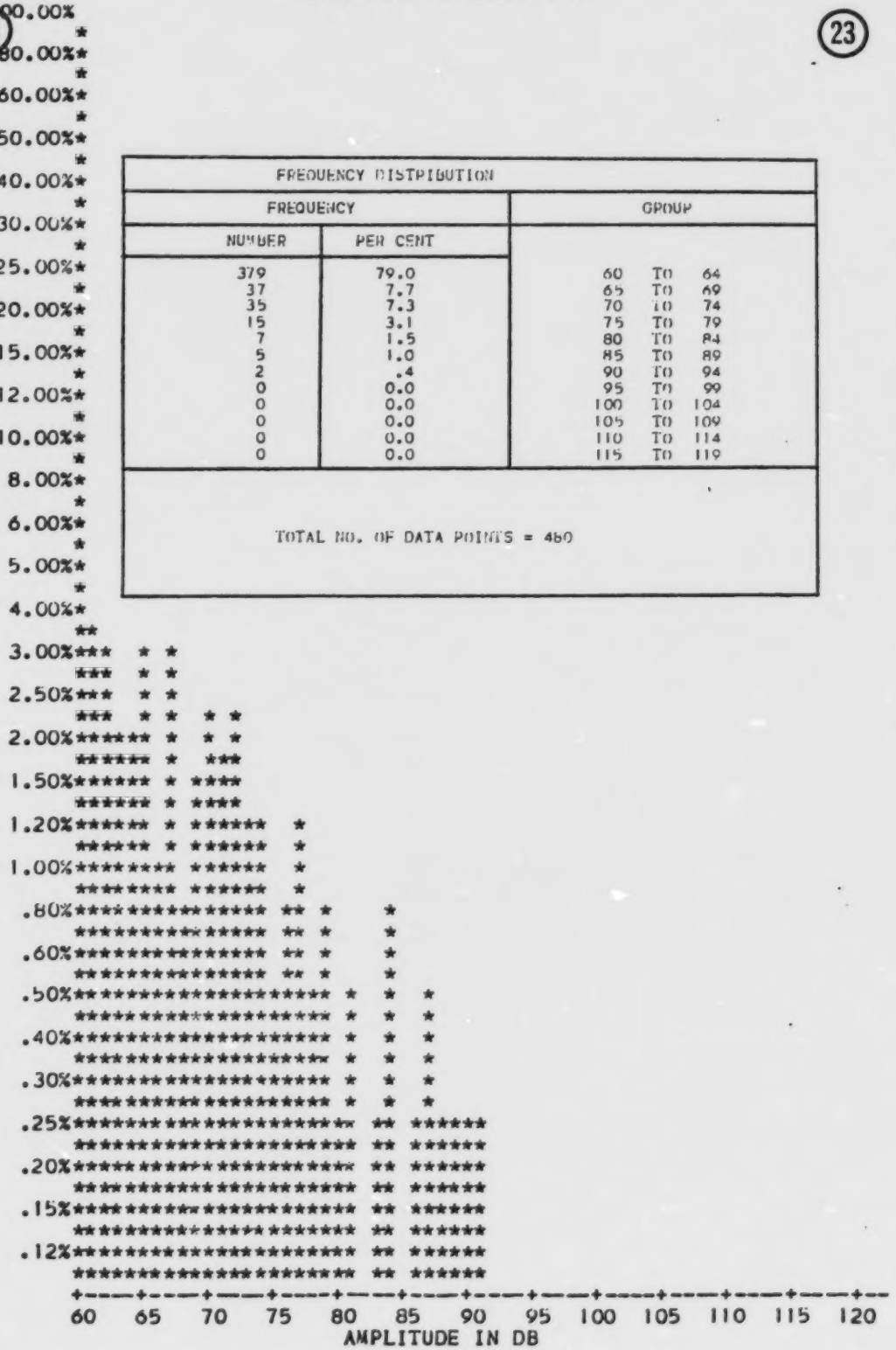
TIME          LEQ(A)                    DOSE
HOUR    CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1       70.1        70.1         .797         .80
   2       66.9        68.7         .508        1.31
   3       63.9        67.4         .345        1.66
   4       64.2        66.6         .303        1.96
   5       60.5        65.7         .209        2.15
   6       60.3        65.0         .203        2.35
   7       64.3        64.6         .619        2.97
   8       74.4        67.5        1.442        4.42
MIN. COMP. =  60 DB              MAX. COMP. =  91 DB
ARITHMETIC MEAN =  62 DB
STD. DEVIATION =  6.94
VARIANCE = 96 DB
```

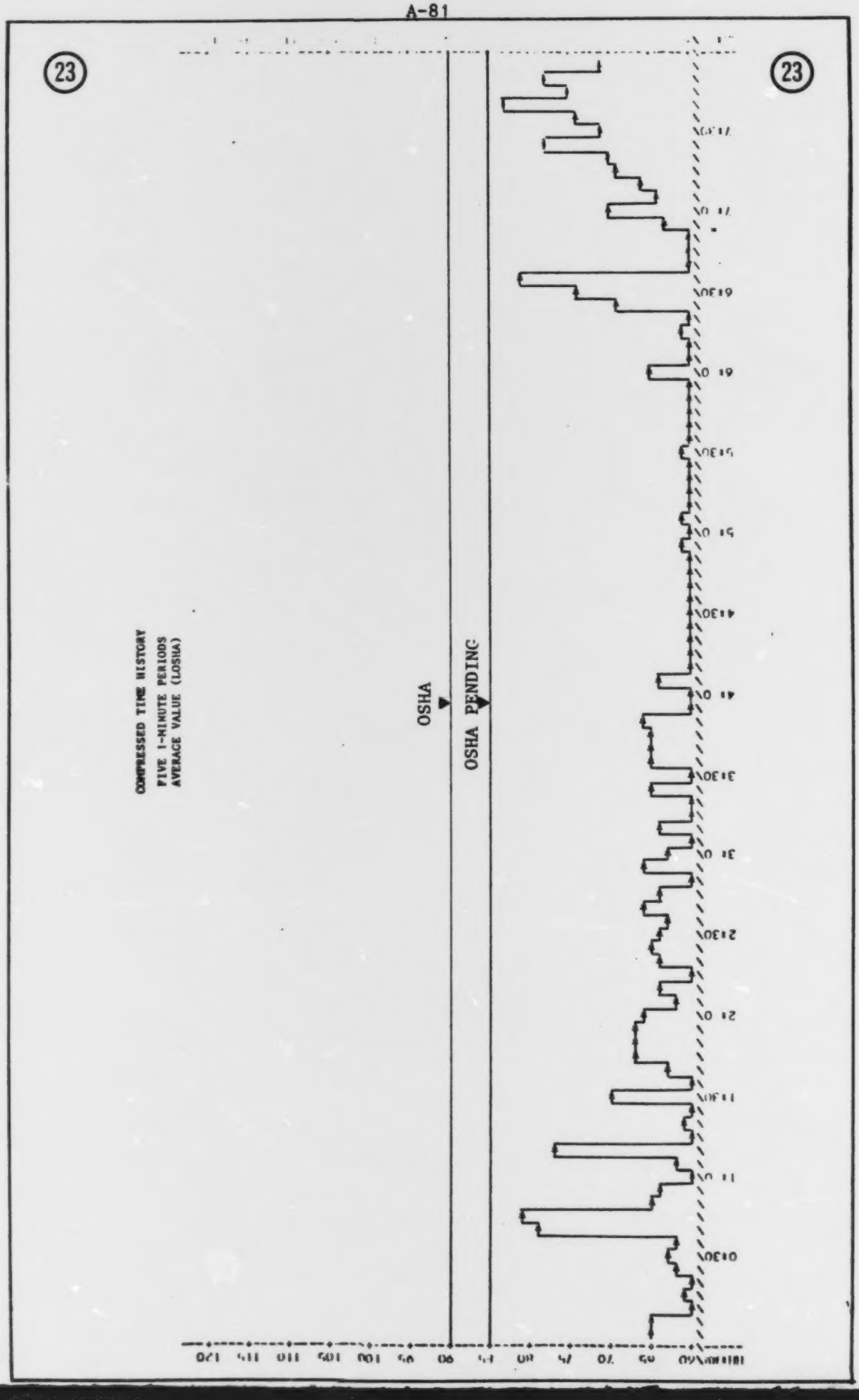
AMPLITUDE DISTRIBUTION

(23) (23)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
379	79.0	60 TO 64
37	7.7	65 TO 69
35	7.3	70 TO 74
15	3.1	75 TO 79
7	1.5	80 TO 84
5	1.0	85 TO 89
2	.4	90 TO 94
0	0.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 460




23
23
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dBA
120
115
110
105
100
95
90
85
80
75
70
65
60
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(24)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1216   60   64    4    1
     115      115200  480
  66  60  61  67  69  71  66  60  60  60  60  60  60  60  60  62
  65  68  62  60  60  64  62  75  74  71  68  60  60  60  60  60
  60  60  60  60  62  71  65  66  64  74  73  68  60  76  63  71
  67  71  72  63  67  69  81  82  85  80  91  91  97  97  96  96
  96  95  96  97  95  94  87  89  87  94  98  93  95  95  90  85
  67  67  65  65  60  61  60  61  60  61  62  73  74  73  72  91
  70  60  60  60  60  64  91  94  95  93  91  94  94  94  94  92
  92  92  89  92  87  60  95  96  94  79  63  76  60  62  60  60
  60  60  60  78  84  67  61  62  65  61  63  64  60  60  60  60
  61  61  60  60  60  60  60  61  74  67  66  91  94  92  94  91
  92  92  94  93  92  91  82  60  60  95  97  96  67  94  92  96
  94  96  94  95  95  94  87  83  81  79  79  70  60  60  60  60
  60  60  60  63  64  80  72  65  63  61  60  60  60  60  60  60
  60  61  60  60  62  64  60  60  61  60  61  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  85  94  95  97  96  99
  96  86  98  95  98  99  97  99  96  94  96  96  97  95  97  95
  99  98  96  94  97  92  70  68  66  61  60  64  63  62  61  62
  60  60  60  61  61  60  61  60  60  60  60  86  96  96  99  99
  96  95  96  95  93  94  95  93  90  95  89  82  83  80  93  87
  84  82  82  82  82  81  81  82  79  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  86  91  92  73  68  60
  73  88  87  83  82  83  84  86  90  88  79  60  60  60  63  60
  61  61  60  62  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  61  60
  60  65  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  85  95  96  97  98
  97  97  98  99  98  89  97  96  97  94  95  95  95  95  89  63
  60  60  60  60  60  60  60  61  61  73  63  60  60  60  60  60
  60  60  60  60  60  60  64  86  93  90  93  86  88  81  81  91
  96  83  60  60  75  60  60  60  60  73  89  85  80  71  86  80
%EOF
```

(24)

```
ENTER LOG DATE (DD/MM/YR) : 11/09/79
ENTER SITE CODE (5 CHARS) : 00344
ENTER USER CODE (4 CHARS) : 4605
 ENTER JOB CODE (3 CHARS) : 230
```

DATA LOGGED :11 SEPT 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1216
BASELINE : 99.09
DYNAMIC RANGE : 94 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 HR 0 M

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 00344
JOB CODE : 230
USER CODE : 4605
CHANNEL : 1
TOTAL SAMPLES = 115200
STARTBY TIME = 8:00:00

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLE) = 5 DB
THRESHOLD (CUTOFF) = 70 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LOW A CUMULATIVE	LOW A CUMULATIVE	HIGH A CUMULATIVE	HIGH A CUMULATIVE
1	73.1	73.1	1.196	1.20
2	90.4	89.0	13.141	14.34
3	87.5	87.9	8.[illegible]	23.23
4	81.6	85.6	4.391	27.62
5	92.5	87.6	17.671	44.92
6	79.6	86.8	3.041	47.96
7	4.1	85.4	4.807	52.77
8	90.3	85.3	7.445	60.21

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 73 DB
STD. DEVIATION = 15 DB
GEOMETRIC MEAN = [illegible]

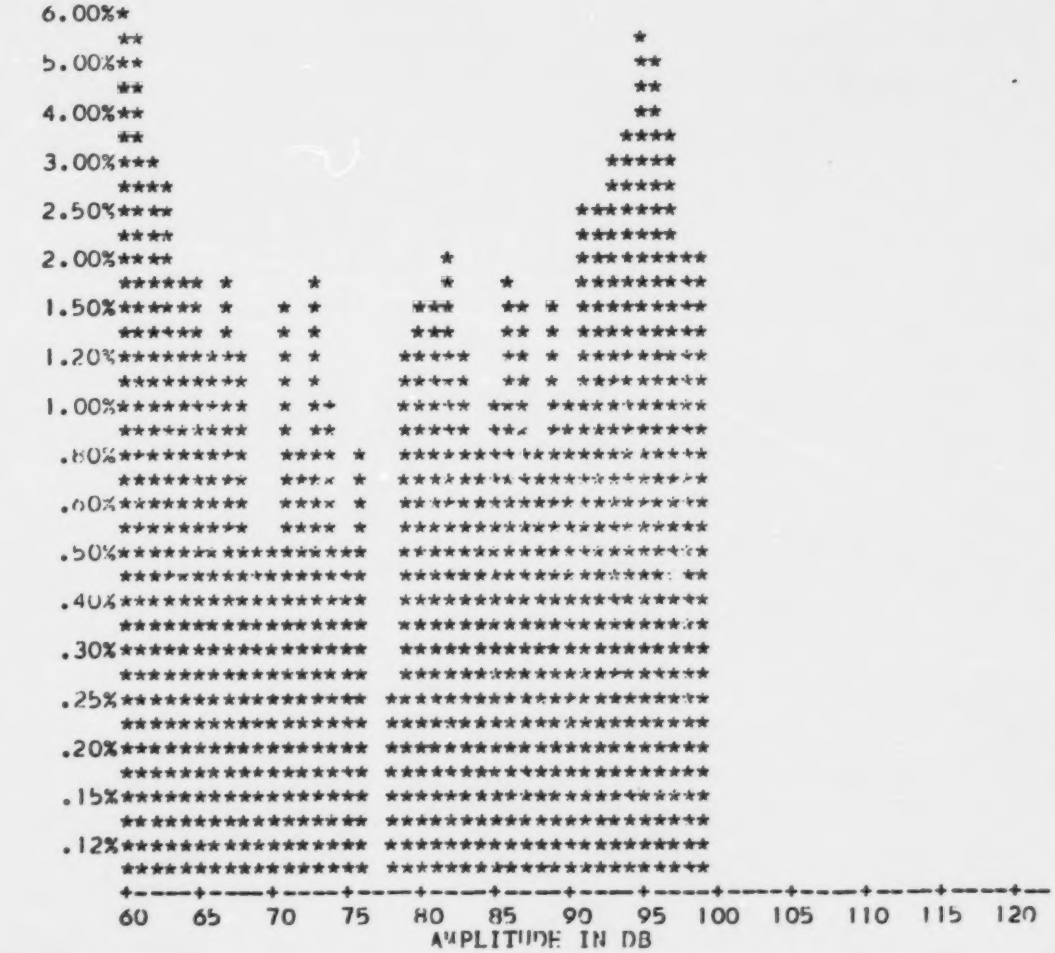
MAX. COMP. = 99 DB

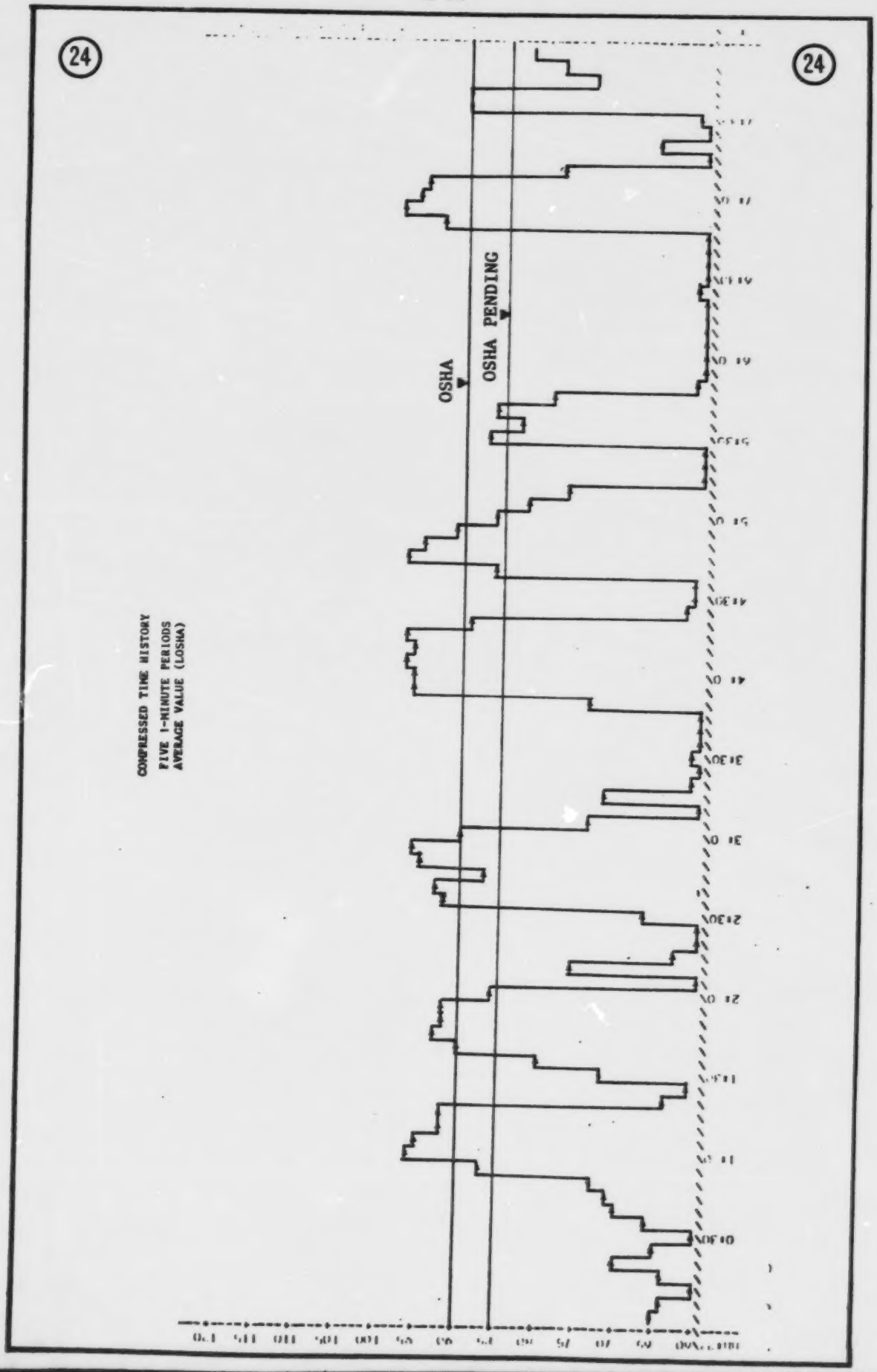
AMPLITUDE DISTRIBUTION

(24) (24)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
243	50.6	60 TO 64
26	5.4	65 TO 69
22	4.6	70 TO 74
11	2.3	75 TO 79
28	5.8	80 TO 84
26	5.4	85 TO 89
52	10.8	90 TO 94
72	15.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




24
24
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(25)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1210   60   64    4    1
     106     115200  480
  61  62  60  60  67  61  60  61  60  62  62  60  61  61  62  60
  60  60  64  65  67  60  60  60  60  67  62  62  69  68  68  64
  60  61  60  61  61  60  62  60  60  60  60  60  60  60  62  60
  60  64  61  60  60  62  62  61  60  61  60  63  73  86  80  82
  76  86  91  92  97  97  97  97  97  96  96  99  97  92  91  91
  85  91  93  90  93  96  92  72  60  60  60  63  60  65  68  65
  60  64  60  60  61  60  61  72  71  72  86  93  92  89  87  85
  60  76  91  90  89  89  93  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  63  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  61  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  85
  73  60  60  60  60  60  60  60  60  60  65  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  95  77
  82  83  83  81  67  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  64  67  69  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  85
  93  96  96  90  85  85  62  70  70  77  80  79  79  75  79  74
  76  64  76  72  66  77  68  80  64  60  60  60  60  78  87  88
%EOF


ENTER LOG DATE (DD/MM/YR) : 10/09/79
ENTER SITE CODE (5 CHARS) : 00344

ENTER USER CODE (4 CHARS) : 4505
 ENTER JOB CODE (3 CHARS) : 230


   DATA LOGGED :10 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
        LOGGER : DS-301/26                 SITE CODE : 00344
 SERIAL NUMBER : 1210                       JOB CODE : 230
      LASFLIT  : 60 SEC                     USER CODE : 4505
 DYNAMIC RANGE : 64 DB                      PROJECT   : [illegible]
 SAMPLING RATE :  4/SEC                  TOTAL SAMPLES = 115200
 TEST DURATION =  8 HRS 0 MIN            START TIME    = 08:08:24

                    SITE HISTORY ANALYSIS

[illegible] EXCEEDANCE INDEX (EI) CALCULATIONS
ALL [illegible] OF THE POPULATION
100% LEVEL = [illegible]
[illegible] (1 PERCENT) LEVEL = [illegible]
[illegible] (10 PERCENT) LEVEL = [illegible]
[illegible] OF EXCEEDANCES = 460
PERIOD =  1 MINUTES

LEVEL          TOTAL                    INCR.
INDEX     PERCENT   CUMULATIVE      PERCENT   CUMULATIVE
   1        62.1        62.1          .251        .25
   2        89.0        84.2        10.961      11.21
   3        60.4        81.4          .204      11.42
   4        60.2        77.6          .195      11.61
   5        60.0        66.0          .195      11.81
   6        72.1        77.3         1.049      12.86
   7        60.6        76.3          .211      13.06
   8        89.6        79.7         2.123      15.18
MIN. CONC. =  60 DB                MAX. CONC. =  98 DB
ARITHMETIC MEAN =  64 DB
STD. DEVIATION =  10 DB
VARIANCE =100 DB
```

(25)

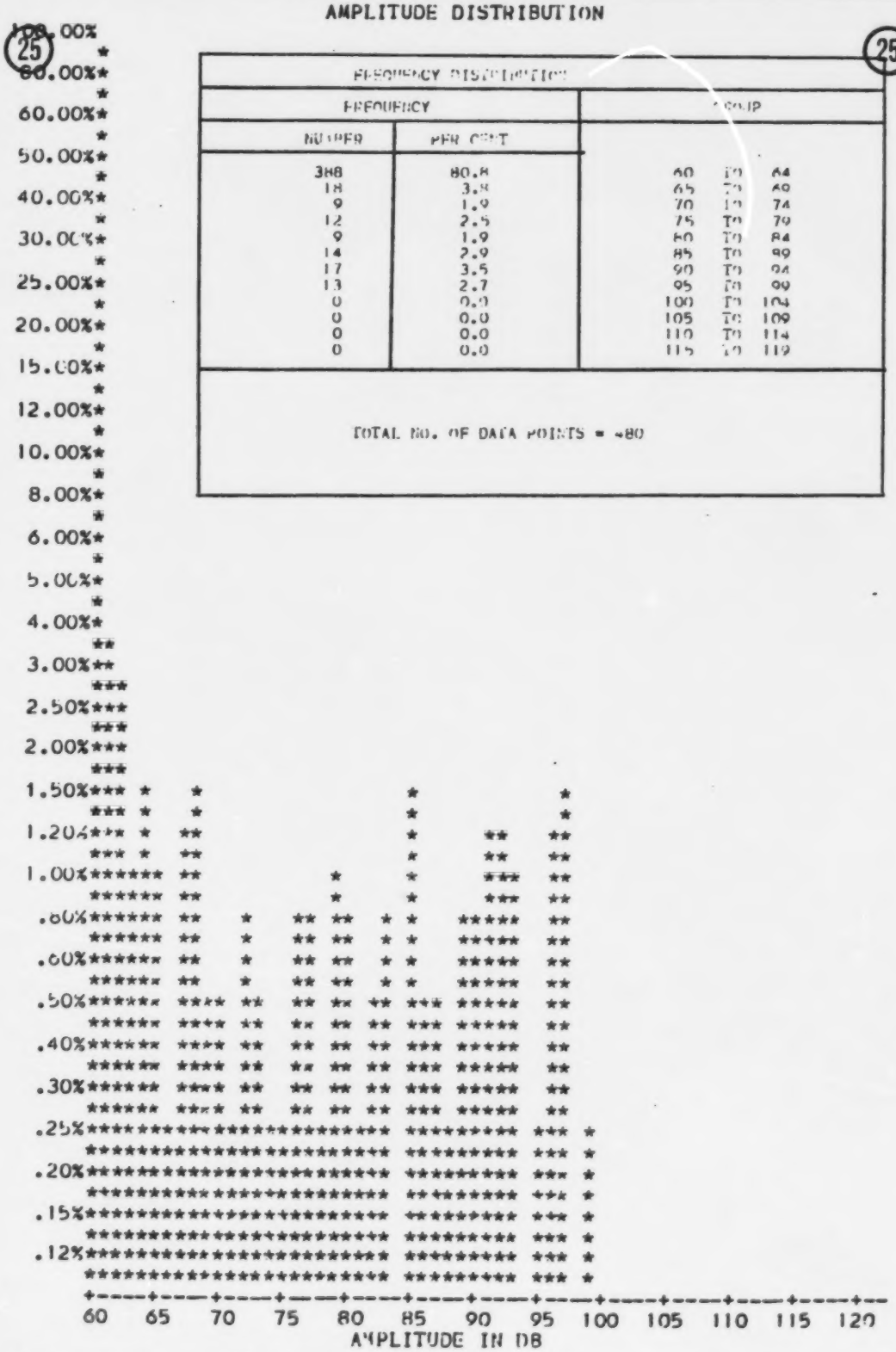
AMPLITUDE DISTRIBUTION

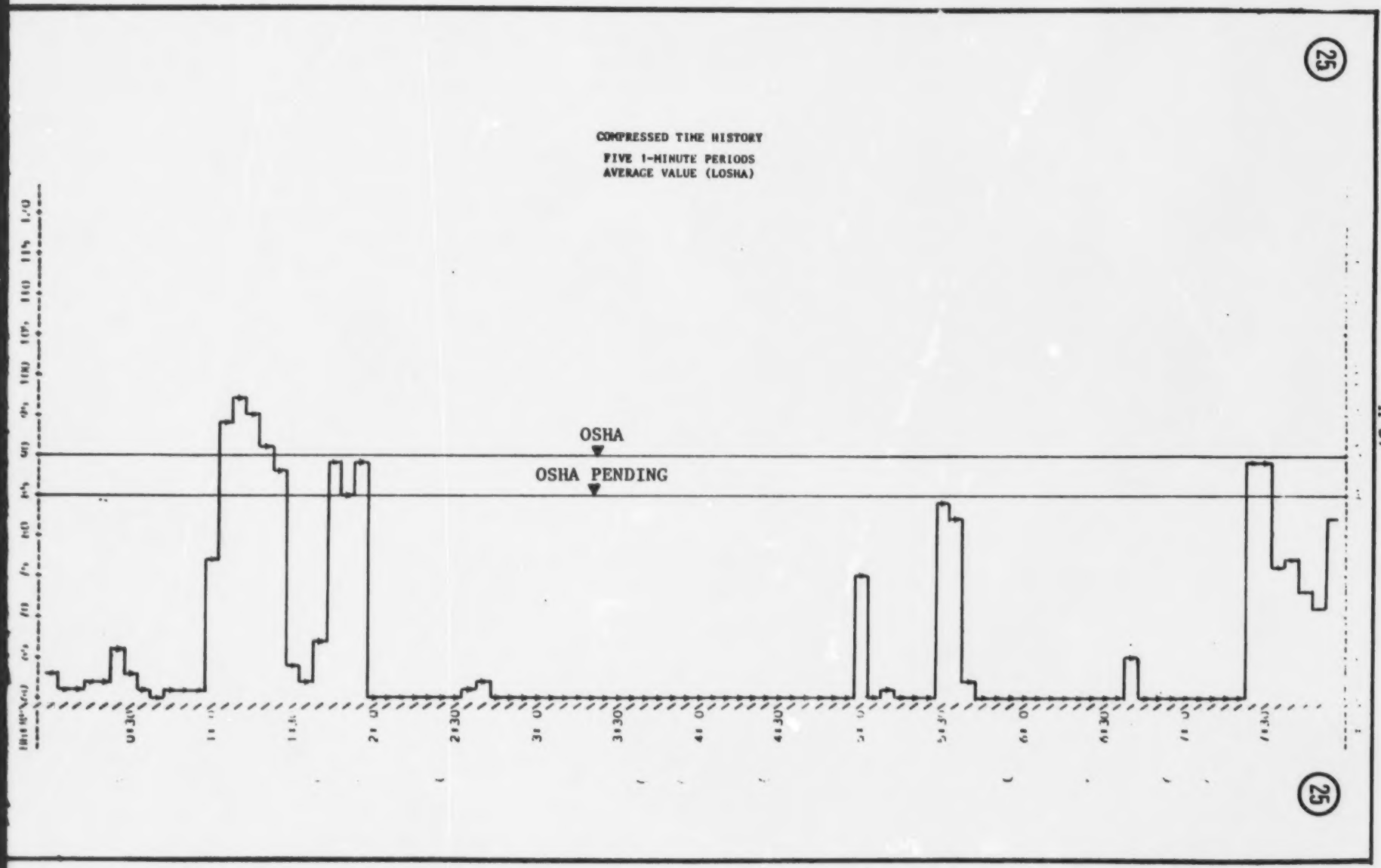
(25) (25)

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
388	80.8	60 TO 64
18	3.8	65 TO 69
9	1.9	70 TO 74
12	2.5	75 TO 79
9	1.9	80 TO 84
14	2.9	85 TO 89
17	3.5	90 TO 94
13	2.7	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




25
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
25

(26)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
 1  26  80  1217    60    64     4     1
    91      115200   480
 60  61  60  65  60  67  73  75  75  60  60  60  61  60  61  60
 60  62  64  64  73  67  62  67  75  70  72  76  66  68  70  63
 72  65  69  67  60  62  66  69  62  66  60  61  64  75  70  66
 78  76  74  80  74  68  65  79  75  81  86  88  82  78  96  84
 85  86  96  91  72  72  70  77  75  71  76  78  75  70  73  72
 72  73  74  66  80  83  73  65  66  69  70  82  84  85  91  90
 89  84  87  87  94  93  80  76  62  66  62  60  60  60  97  60
 72  78  95  97  96  96  97  95  96  97  97  87  62  60  63  78
 75  60  60  60  63  63  60  60  67  60  62  60  60  60  60  60
 60  72  60  60  64  60  60  60  60  60  60  60  60  60  60  60
 60  60  65  87  84  83  83  84  84  81  85  82  87  78  85  84
 68  64  60  60  79  85  84  84  83  83  83  83  82  84  84  83
 64  73  69  67  71  75  63  75  65  70  73  69  76  64  68  66
 74  68  61  65  62  60  60  66  60  65  60  66  61  66  66  73
 62  60  74  63  60  63  71  60  71  80  60  60  72  85  86  71
 60  60  60  60  60  60  60  68  90  80  92  86  81  78  81  73
 66  60  60  60  63  67  69  86  73  72  83  75  82  85  83  80
 81  80  82  81  79  72  79  75  76  73  80  82  84  84  86  84
 89  83  84  81  84  84  83  85  70  83  82  81  80  82  81  83
 81  80  76  80  77  75  77  85  80  80  83  84  84  83  83  80
 81  80  80  81  79  61  60  65  64  61  75  91  81  84  83  82
 89  85  92  84  82  84  83  97  81  66  86  67  60  76  85  77
 69  60  91  81  82  82  82  82  82  82  82  82  82  82  82  82
 82  82  82  82  82  82  83  82  82  82  82  82  82  82  82  82
 82  83  82  82  82  82  83  83  82  84  90  82  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 71  65  60  60  60  90  82  94  98  94  95  97  99 100  98  99
 98  99 100  98  94  96  90  91  99 100 100  99  99  99 100 100
 99  97 101  91  93  81  82  80  81  80  78  80  80  80  80  88
 93  84  97  92  85  89  92  93  96  98  96  95  95  95  95  95
EOF
```

(26)

```
ENTER LOG DATE (DD/MO/YR) : 11/09/79
ENTER SITE CODE (5 CHARS) : 00347
ENTER USER CODE (4 CHARS) : 4609
 ENTER JOB CODE (3 CHARS) : 230
```

DATA LOGGED : 11 SEPT 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1217
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

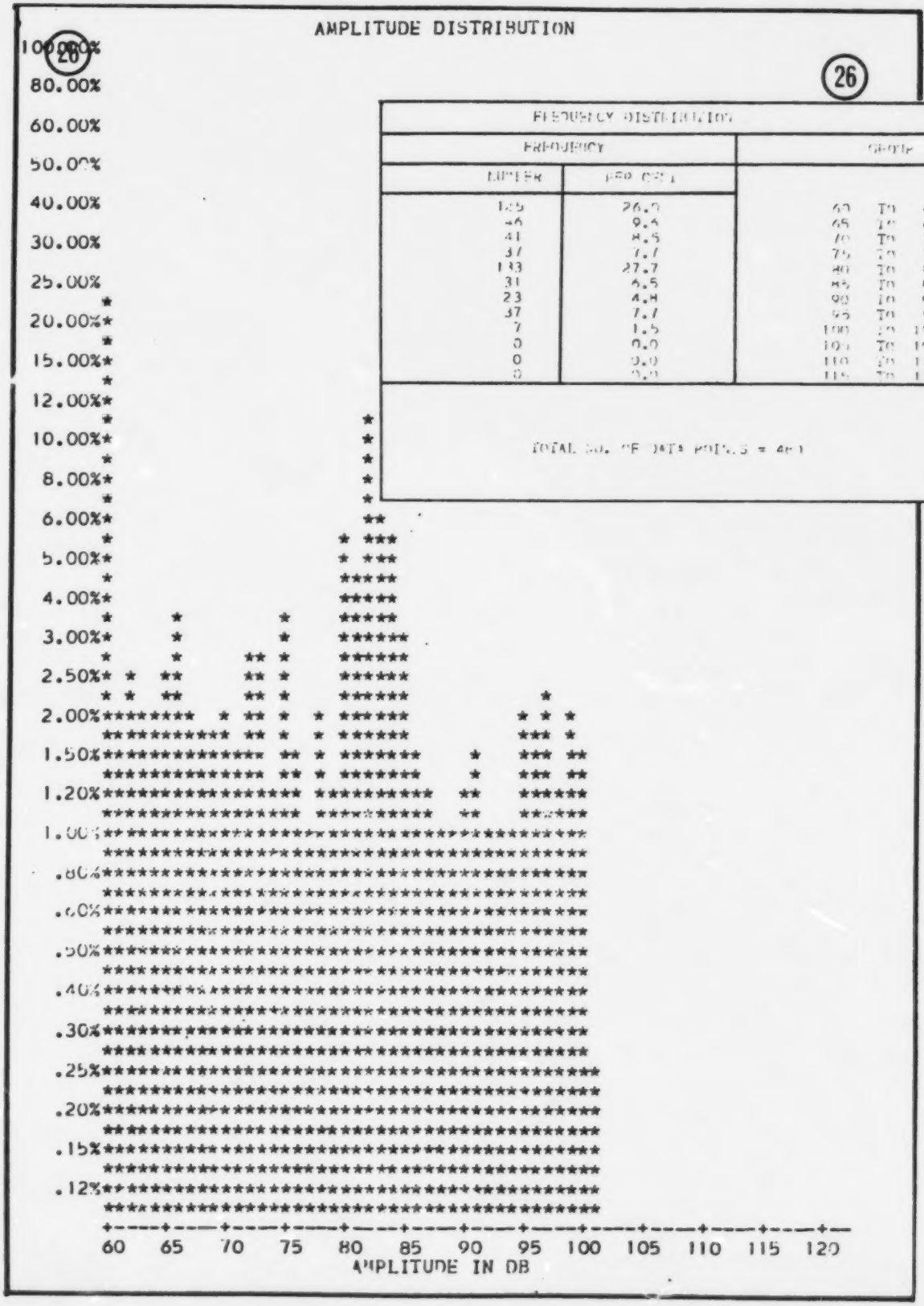
DATA ANALYZED : 27 SEPT 1979
SITE CODE : 00347
JOB CODE : 230
USER CODE : 4609
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:22

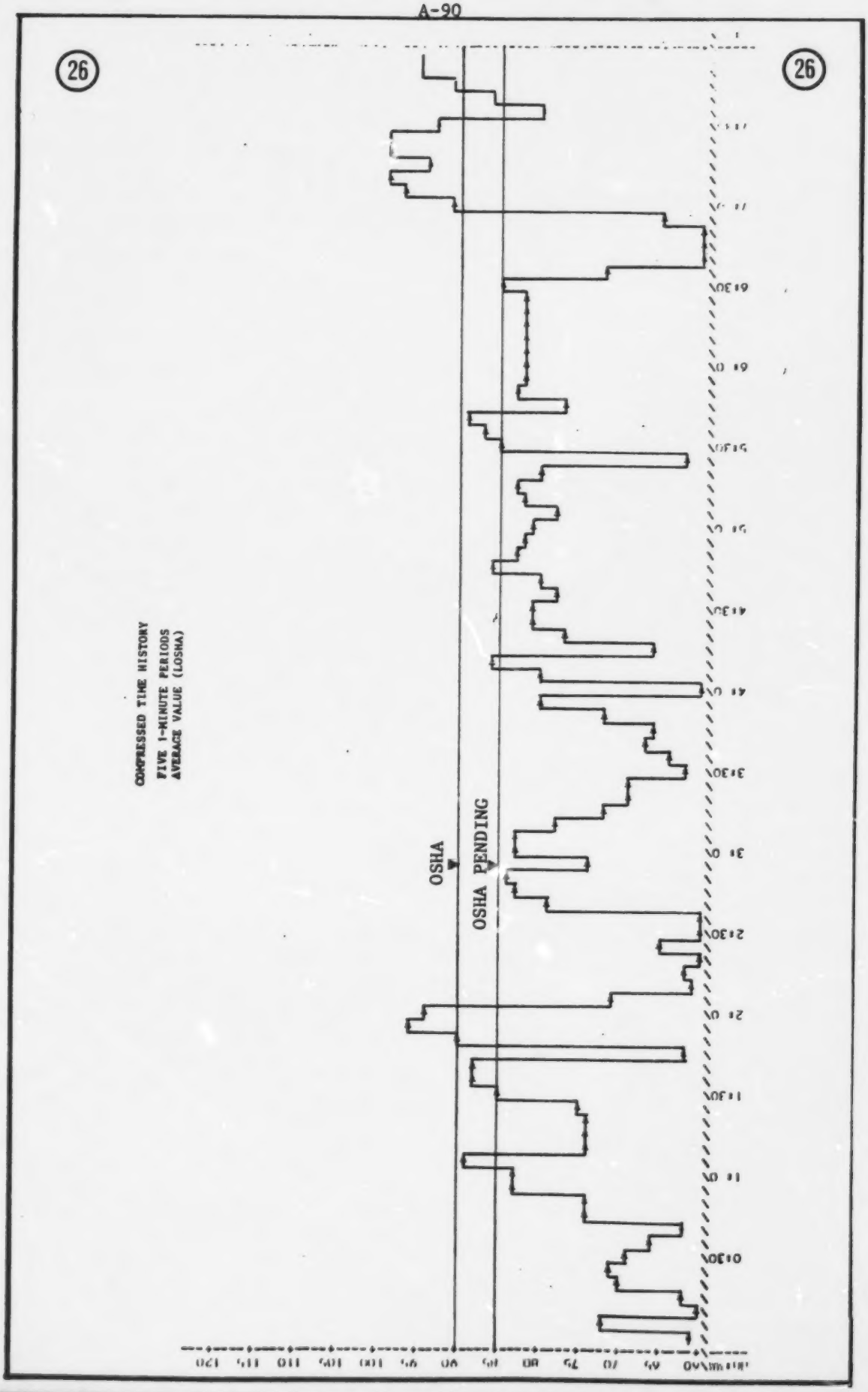
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL TIME = 20 DAYS / 8 HRS
FACTOR (DOUBLED RATE) = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	72.0	72.0	1.037	1.04
2	66.2	69.1	3.345	4.38
3	66.0	68.5	7.128	11.51
4	79.5	69.4	1.673	13.18
5	80.7	70.4	3.445	16.63
6	82.6	80.9	4.478	21.10
7	79.1	80.6	2.770	23.87
8	95.0	84.9	25.131	49.01

MIN. COMP. = 60 DB
MAX. COMP. = 101 DB
ARITHMETIC MEAN = 75 DB
STD. DEVIATION = 12 DB
VARIANCE = 144 DB


AMPLITUDE DISTRIBUTION
26
26
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
125 26.0
46 9.6
41 8.5
31 6.5
133 27.7
31 6.5
23 4.8
37 7.7
7 1.5
0 0.0
0 0.0
0 0.0
TOTAL NO. OF DATA POINTS = 481
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


26
26
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
dB(A)
65
70
75
80
85
90
95
100
105
110
115
120

(27)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1213   60    64     4     1
     95      115200  480
  64  60  61  62  71  73  71  60  60  60  60  60  60  60  60  60
  62  66  70  68  61  60  60  60  60  61  60  60  60  61  60  60
  60  60  60  60  63  60  66  60  60  68  69  70  67  72  68  66
  68  62  64  70  69  74  79  79  85  88  79  81  86  87  85  90
  92  88  71  67  72  76  72  6n  73  73  64  62  63  65  65  72
  66  60  71  64  64  64  60  68  73  71  84  87  91  88  89  85
  75  80  96  84  71  77  66  63  62  60  60  83  95  90  81  81
 100  98  99  99  99  98  96  98  97  72  60  60  60  60  60  60
  60  60  60  60  60  60  65  60  62  60  60  60  60  60  71  65
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  65  82  81  78  78  75  82  78  80  80  83  70  88  82  60  60
  60  60  85  82  82  81  81  81  81  81  81  82  77  74  61  64
  61  61  77  74  64  62  60  61  60  60  60  60  60  60  60  60
  60  60  60  60  61  61  62  60  61  62  60  60  61  60  64  60
  62  60  67  77  60  60  90  60  60  61  60  97  91  60  60  60
  60  60  60  60  60  94  81  81  96  82  82  82  80  60  60  60
  60  60  60  60  64  60  60  63  62  60  60  62  63  60  61  63
  66  62  60  60  77  60  60  60  60  63  73  61  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  93  95  81  82  82  82  82  82  82  83  83  83
  84  84  78  60  60  65  62  60 102  83  84  83  83  90  82  84
  94  82  83  82  91  98  60  81  93  60  60  78  82  71  70  78
  86  79  80  80  81  81  80  80  81  80  81  81  81  81  81  81
  81  81  81  81  82  81  81  81  81  81  81  81  81  81  81  81
  81  81  81  81  81  81  81  84  88  64  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  65  67
  95  89  82  93  82  96  96  90  97  97  98  98  97  97  97  97
  97  96  94  94  84  93  97  98  97  95  96  97  96  95  95  95
  96  80  60  80  79  79  80  80  80  75  60  79  93  86  89  91
  94  85  85  82  89  93  97  96  95  95  95  94  95  95  95  94
%EOF


ENTER LOG DATE (DD/MM/YR) : 11/09/79
ENTER SITE CODE (5 CHARS) : 00347

ENTER USER CODE (4 CHARS) : 4527
 ENTER JOB CODE (3 CHARS) : 230


   DATA LOGGED : 11 SEPT 1979
        LOGGER : DS-301/24
SERIAL NUMBER  : 1213
    BASELINE   : 60 %
DYNAMIC RANGE  : 96 DB
SAMPLING RATE  : 4/SEC
TEST DURATION  =   [illegible]

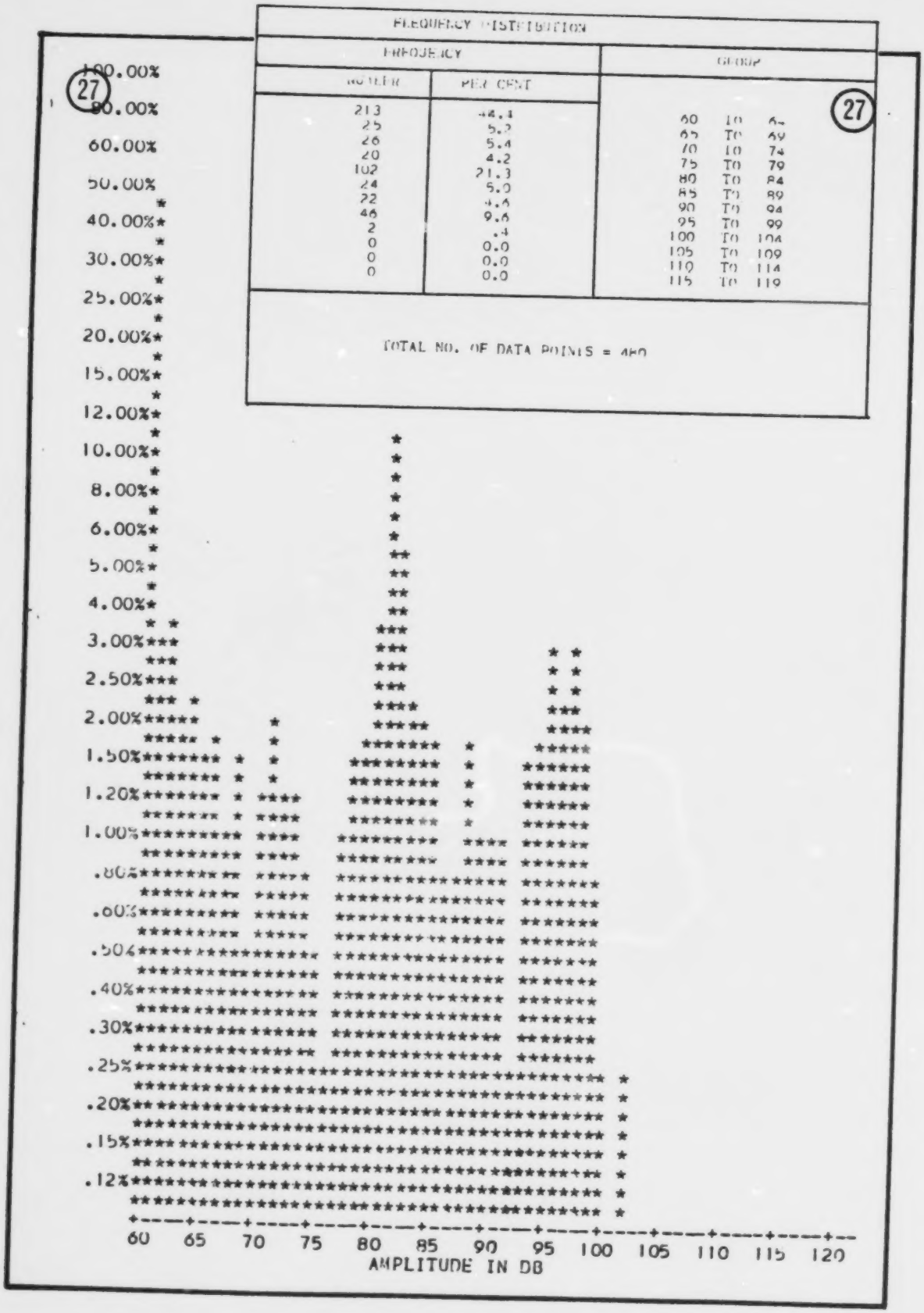
DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 00347
     JOB CODE : 230
    USER CODE : 4527
   [illegible]
TOTAL SAMPLES =  115200
 [illegible]


          [illegible] HISTORY ANALYSIS

[illegible] [illegible] INDEX (L.E.I.) CALCULATIO...
[illegible] [illegible] PERIOD :
[illegible] = [illegible] / [illegible]
[illegible] ([illegible]) [illegible] = [illegible]
[illegible] [illegible] [illegible] = [illegible]
  NUMBER OF CORRELATIONS = 480
PERIOD =  1 MINUTES

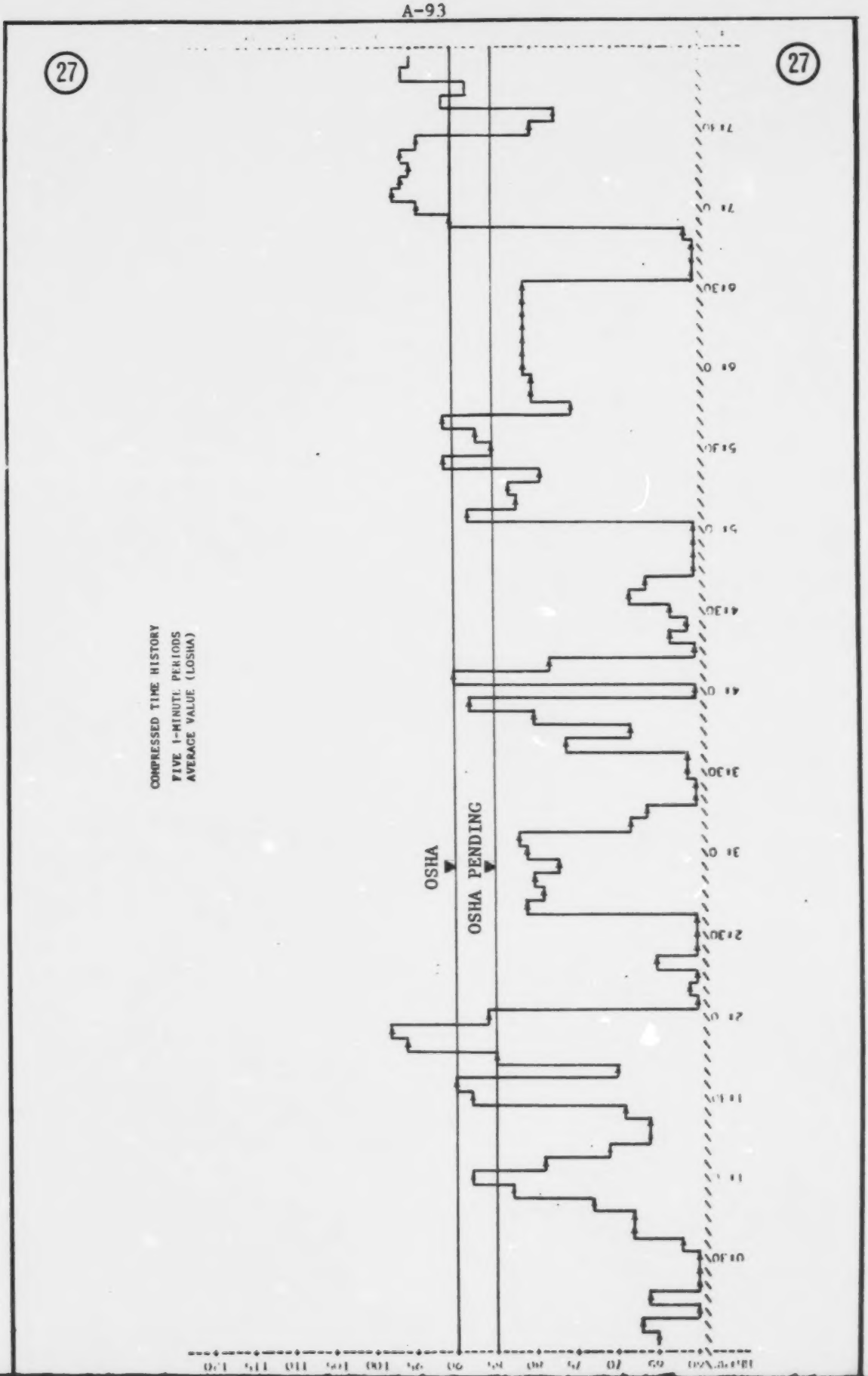
[illegible]        LOUDNESS                    NOISE
[illegible]  [illegible]  CUMULATIVE     [illegible]  CUMULATIVE
    1        70.2         70.2           .80m         .81
    2        87.9         83.5          9.347        10.16
    3        [illegible]  [illegible]    1.703        11.86
    4        [illegible]  [illegible]    2.096        13.96
    5        74.5         79.9          1.495        15.46
    6        84.7         81.0          6.003        21.46
    7        [illegible]  [illegible]    3.173        24.63
    8        93.4         84.2          20.069       44.64
MIN. COMP. =  60 DB                  MAX. COMP. =  102 DB
ARITHMETIC MEAN =  [illegible] DB
STD. DEVIATION =  [illegible]
VARIANCE =  [illegible] DB
```

(27)



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
213	44.4	60 TO 64
25	5.2	65 TO 69
26	5.4	70 TO 74
20	4.2	75 TO 79
102	21.3	80 TO 84
24	5.0	85 TO 89
22	4.6	90 TO 94
46	9.6	95 TO 99
2	.4	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

27


27
27
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(28)

```
  1  26  80  1214    60    64     4     1
    105     115200  480
 62  70  70  67  60  60  60  60  60  60  60  60  60  61  69  70
 61  61  60  77  71  71  68  60  69  61  60  60  60  74  61  60
 60  64  65  61  60  60  60  60  64  64  74  78  67  72  65  71
 63  61  67  79  76  85  85  85  91  91  97  97  95  97  97  95
 98  97  88  80  74  79  60  60  62  60  60  67  60  60  64  65
 60  60  60  60  61  60  61  69  68  62  60  60  72  60  64  67
 67  61  60  67  73  62  62  65  63  62  63  70  60  63  61  60
 60  66  69  61  68  62  60  64  60  60  60  61  60  63  65  64
 71  66  74  72  77  70  77  71  60  68  60  65  60  63  62  69
 75  60  69  61  65  62  62  60  60  60  60  61  64  66  65  63
 60  61  63  60  60  60  62  64  63  62  60  60  68  60  62  60
 62  60  60  60  60  66  60  61  60  60  63  60  69  60  62  82
 75  69  61  60  61  62  60  60  66  72  60  65  69  66  65  70
 64  69  62  72  77  84  98  82 102  96  96  95  94  95  95  95
 94  95  96  96  96  90  70  90  91  96  98  92  97  99  95  97
100  98 100  99  98 101  98  98  96 100  95  96  97  95  97  97
 94  95  97  92  98  94  94  98  95  95  97  96  96  96 102  95
 63  61  60  68  61  63  60  60  63  64  62  60  60  60  62  63
 66  60  62  65  61  60  60  60  64  66  63  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  69  60  65  67  60  67  60  60  60  60  60  60  60  60
 69  60  60  62  60  60  60  64  60  63  60  60  60  61  60  61
 61  64  61  62  62  60  61  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  64  60  60  60  60  60
 60  69  75  60  65  70  99  96  94  87  88  92  96  98  98  98
 97  95  93  77  96  95  79  98 101 101 101 101 100 101 100 100
 95  96  99 101 101 102 100 100  92  86  86  87  87  88  89  93
101 102 102 102 102 101 103 103 101 100 100  98  99  99  93  96
100  95  97  96  95 101 100  80  74  94 104 105 100  62  64  83
%EOF
```

(28)

ENTER LOG DATE (DD/MM/YR) : 11/09/79

ENTER SITE CODE (5 CHARS) : 00348

ENTER USER CODE (4 CHARS) : 4830
ENTER JOB CODE (3 CHARS) : 230

DATA LOGGED :11 SEPT 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1214
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 48 00 0

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 00348
JOB CODE : 230
USER CODE : 4830
THRESHOLD : 60 DB
TOTAL SAMPLES = 11520
STARTAT = 28 0826

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATION
ARE BASED ON THE FOLLOWING
100% LOG = 90.0 / 2.0 DB
EXCHANGE (DOUBLED) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOG		ANTILOG	
CODE	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	84.1	78.1	2.404	2.40
2	81.2	79.8	3.497	6.10
3	75.6	77.4	.427	6.53
4	82.5	82.1	11.717	18.24
5	92.1	86.1	18.204	36.44
6	81.4	84.8	.237	36.68
7	84.7	84.4	6.024	42.71
8	88.4	84.5	30.207	72.91

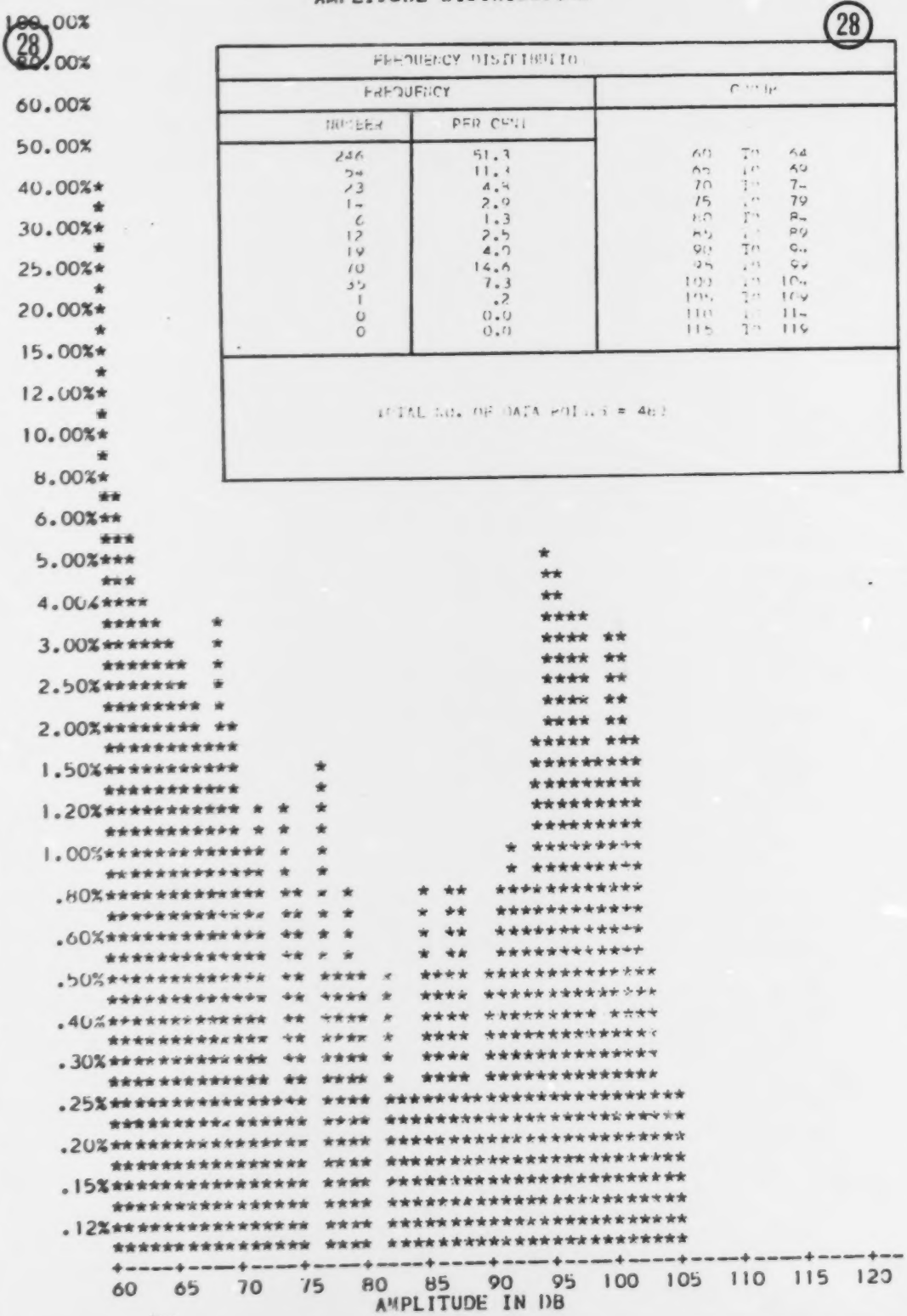
MIN. COMP. = 60 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 14 DB
VARIANCE = 200 DB
MAX. COMP. = 105 DB

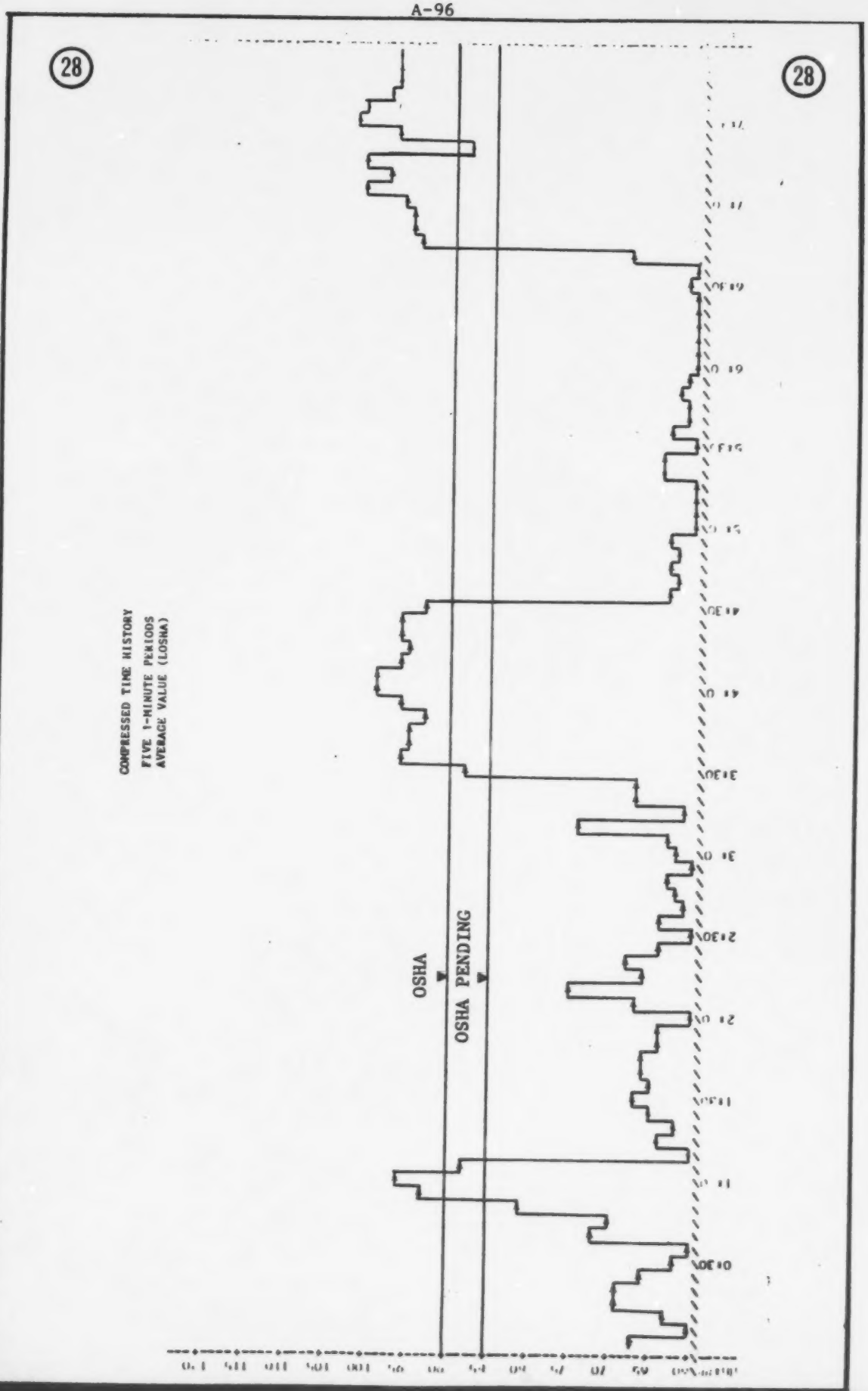
AMPLITUDE DISTRIBUTION

(28)

(28)

FREQUENCY DISTRIBUTION		
FREQUENCY		CLASS
NUMBER	PER CENT	
246	51.3	60 TO 64
54	11.3	65 TO 69
23	4.8	70 TO 74
14	2.9	75 TO 79
6	1.3	80 TO 84
12	2.5	85 TO 89
19	4.0	90 TO 94
70	14.6	95 TO 99
35	7.3	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




28
28
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(29)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1217   60   64    4    1
     81      115200  480
 60  60  60  60  60  60  60  60  60  60  60  60  60  64  64  72
 73  63  70  60  60  62  60  60  60  66  64  64  61  71  60  76
 71  67  66  61  63  68  70  72  69  65  70  62  66  60  66  63
 53  61  62  64  66  72  73  67  72  77  73  77  72  79  90  91
 92  96  95  92  93  95  96  92  97  97  92  74  60  72  60  60
 60  65  60  61  62  60  65  67  60  60  65  62  65  60  60  60
 60  60  61  60  60  60  64  65  64  69  60  63  64  60  65  66
 66  71  64  62  65  63  67  66  67  69  65  65  62  66  61  65
 65  60  60  66  63  60  60  60  63  67  67  64  60  62  62  63
 60  67  60  60  60  60  70  60  61  65  65  60  60  62  63  60  65
 67  60  63  60  60  63  60  60  60  60  60  61  62  65  70  72
 65  69  64  64  60  60  61  60  60  73  75  94 105  93  91  76
104  94  95  96  95  95  94  94  94  93  93  93  94  93  92  88
 94  94  94  94  93  87  75  97  92  96  97  96  97  98  96  95
 94  87  93  86  91  93  95  93  86  93  91  89  94  93  83  83
 83  83  83  83  83  83  83  83  83  83  83  83  83  83  88  95
 91  92  95  97  95  89  91  95  84  94  93  95  95  92  89  91
 95  93  91  95  95  95  95  96  96  81 102  94  96  97  97  95
 95  94  94  94  93  93  95  93  90  60  65  60  62  66  66  68
 61  61  70  63  62  60  70  67  71  61  61  67  60  73  76  69
 70  72  74  79  83  76  67  60  70  60  60  60  61  60  65  60
 79  72  66  71  74  82  76  63  61  65  62  64  74  76  78  89
 91  60  60  63  61  63  60  64  67  69  61  65  69  64  75  71
 61  71  87  77  93  95  94  93  93  93  93  93  93  94  93  93
 97  96  95  95  95  95  95  95  95  97  95  94  94  94  94  95
 95  95  95  95  95  92  95  95  91  94  95  89  88  90  87  87
 87  88  87  91  93  94  94  87  95  91  93  90  89  92  91  95
 95  96  75  72  74  76  77  79  73  76  76  71  82  79  84  83
 75  87  84  87  86  82  73  77  85  82  89  74  75  91  77  72
 84  96  99  99  98  99 101  98  99  93  97 105 102  98 100  93
%EOF
```

(29)

```
ENTER LOG DATE (MO/DA/YR) : 12/09/79
ENTER SITE CODE (5 CHARS) : 00348

ENTER USER CODE (4 CHARS) : 4531
 ENTER JOB CODE (3 CHARS) : 230
```

```
   DATA LOGGED :12 SEPT 1979
      LOG# : 78-301/26
SERIAL [illegible] : 1217
      [illegible] :
      [illegible] :
SAMPLE [illegible] : 4/60
TEST [illegible] =  .4  : 1

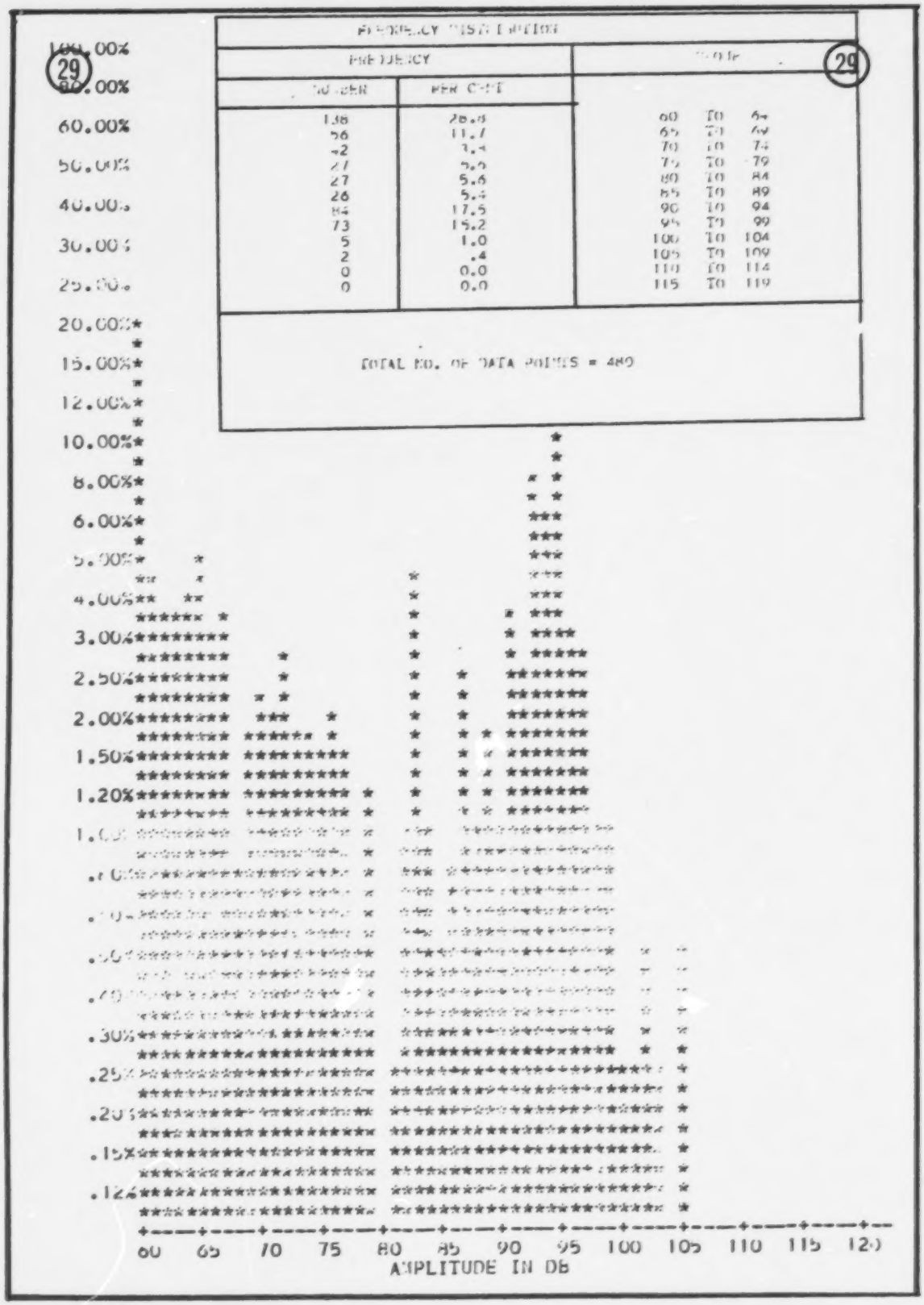
DATA ANALYZED : 27 SEPT 1979
   SITE CODE : 00348
   JOB CODE : 230
   [illegible] : 4531
   [illegible] :
TOTAL SAMPLES = 115200
   [illegible] =  .4  : 1
```

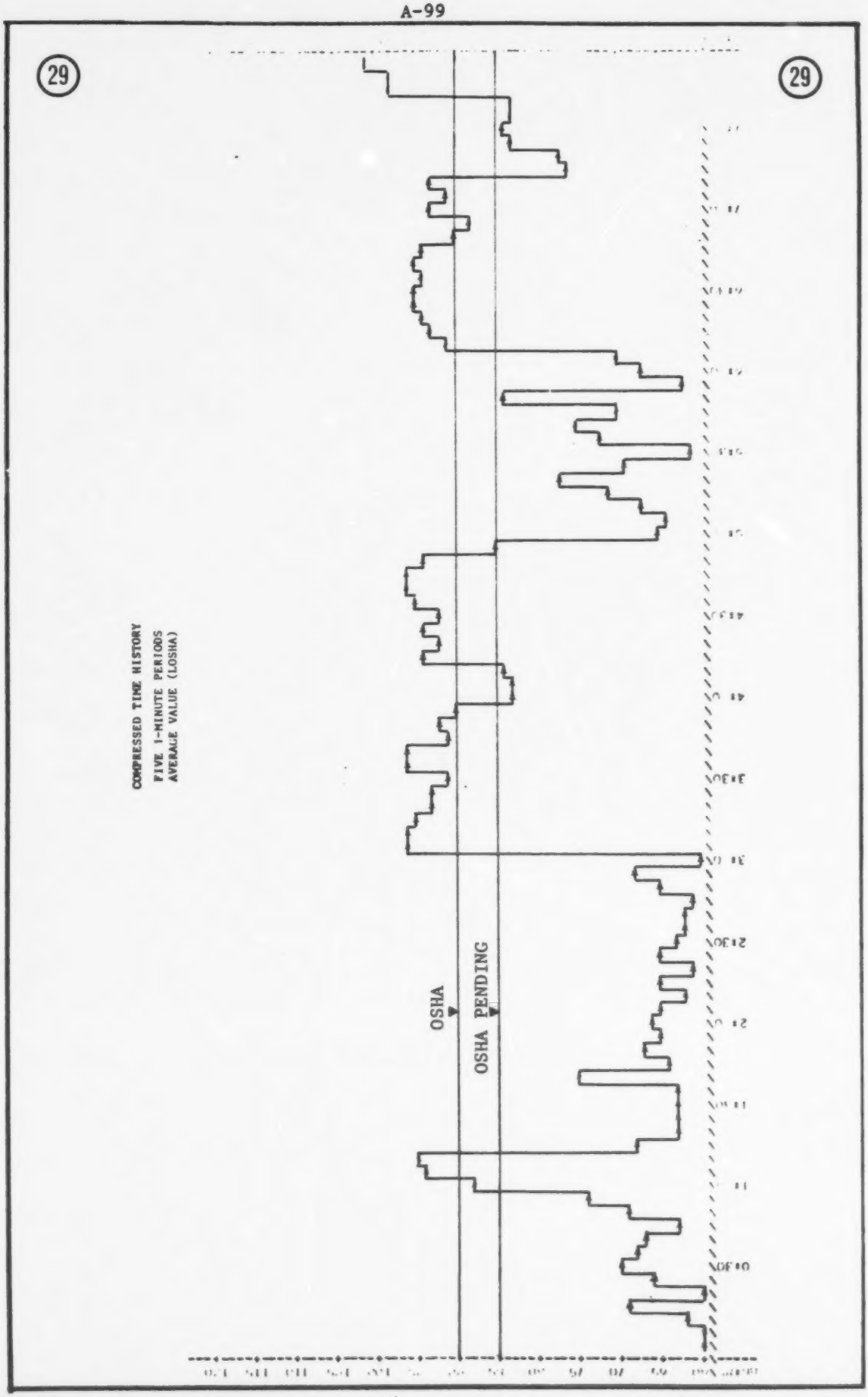
```
          TIME HISTORY ANALYSIS

ARIAS INTENSITY INDEX (Ia,Ie) CALCULATION
[illegible] FOLLOWS:
[illegible] 4/60
[illegible] ) DATA = 0.2
[illegible] ) Level = 0.2 in
   NUMBER OF COMPUTATIONS = 460
PERIOD = 1 MINUTES
```

[illegible]	Ia	Ie	Ia/Ie
1	67.0	67.0	.515
2	83.1	79.4	5.202
3	[illegible]	[illegible]	.334
4	83.2	79.1	14.482
5	82.2	77.2	16.215
6	83.2	80.1	1.211
7	80.1	77.3	14.121
8	80.4	80.2	17.452

```
Min. COMP. = 60 DB                MAX. COMP. = 105 DB
ARITHMETIC MEAN =  77.08
GEOM. DEVIATION =  14.92
VARIANCE =  [illegible]
```


29
29
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
60 TO 64
65 TO 69
70 TO 74
75 TO 79
80 TO 84
85 TO 89
90 TO 94
95 TO 99
100 TO 104
105 TO 109
110 TO 114
115 TO 119
136 28.3
56 11.7
27 5.6
26 5.4
84 17.5
73 15.2
5 1.0
2 .4
0 0.0
0 0.0
TOTAL NO. OF DATA POINTS = 480
60.00%
50.00%
40.00%
30.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
.30%
.25%
.15%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


29
29
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(30)

```
 1  26  80  1219    60    64     4     1
       90      115200   480
 63  60  60  60  60  60  61  63  63  60  68  71  74  67  60  63
 70  74  77  62  62  60  60  63  70  65  70  74  73  78  69  63
 69  61  72  70  71  70  77  72  72  74  82  66  63  67  65  74
 68  67  74  70  68  71  74  74  66  69  71  67  61  67  68  60
 64  60  60  70  71  70  71  69  73  77  77  65  60  60  60  60
 60  63  61  71  60  60  63  72  78  84  91  89  90  96  96  91
 89  88  90  90  93  88  87  86  86  86  90  88  88  88  90  90
 89  89  82  65  68  60  60  60  70  62  61  60  60  63  64  60
 60  60  64  68  60  71  60  70  60  60  60  60  60  67  74  69
 72  67  67  60  66  70  73  69  60  71  70  60  64  60  60  71
 71  60  65  66  60  67  60  60  68  69  60  64  60  71  61  60
 62  61  66  68  71  71  62  63  60  60  60  60  60  60  60  62
 60  60  60  74  63  60  60  60  60  60  65  85  79  91  92  90
 87  73  68  79  60  60  60  89  86  86  82  87  88  87  89  86
 84  93  85  77  85  86  88  82  78  81  89  90  89  88  91  96
 81  78  69  62  65  90  87  88  88  93  95  95  95  95  94  94
 95  95  95  95  96  94  95  95  95  94  96  95  95  94  94  94
 95  95  95  95  97  97  95  94  93  96  95  95  94  94  94  94
 95  95  95  95  94  94  94  95  94  94  95  95  87  67  73  65
 66  65  63  60  60  60  60  60  61  60  60  60  60  60  61  60
 60  61  60  60  60  60  60  61  60  60  62  62  60  83  87  70
 90  84  70  87  88  89  88  89  87  89  89  89  89  88  89  89
 89  88  90  89  87  89  89  87  60  60  60  60  74  60  60  60
 60  60  70  60  60  60  60  60  85  85  92  92  90  91  92  92
 92  92  91  91  83  60  68  60  88  89  90  89  87  90  88  89
 91  91  91  88  90  90  90  91  91  91  90  91  90  91  91  91
 91  90  92  90  88  90  89  89  91  90  90  90  90  92  90  89
 87  89  88  89  88  90  89  90  90  91  90  91  90  90  90  91
 85  90  91  91  90  91  90  89  89  88  88  89  92  80  86  91
 63  68  93  93  94  94  95  86  96  95  93  93  93  93  93  92
%EOF
```

(30)

ENTER LOG DATE (DD/MM/YR) : 10/09/79
ENTER SITE CODE (5 CHARS) : 00350
ENTER USER CODE (4 CHARS) : 4267
ENTER JOB CODE (3 CHARS) : 230

DATA LOGGED : 10 SEPT 1979
LOGGER : DR-301/26
SERIAL NUMBER : 1219
BASELINE : 50 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 HR 0 M

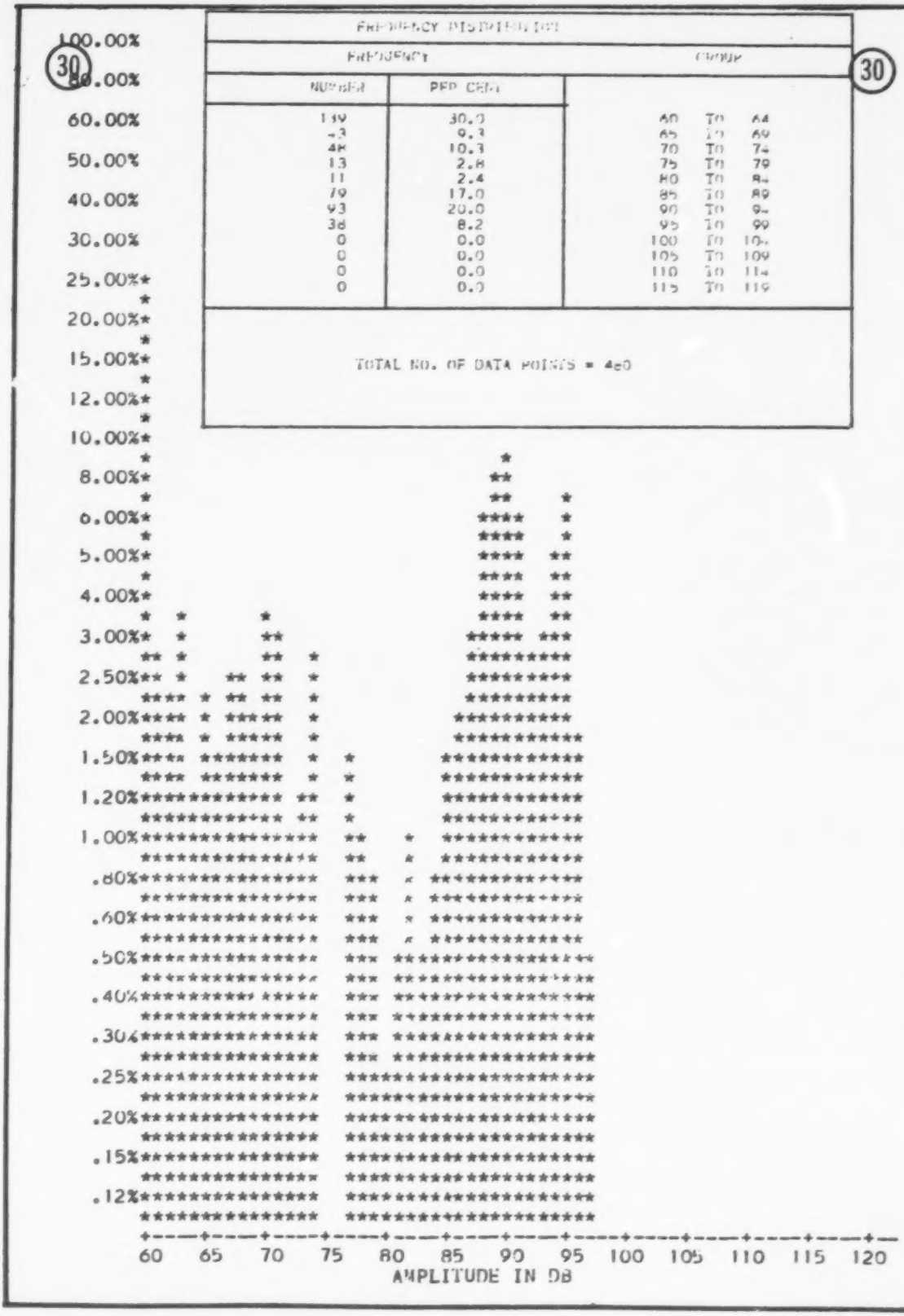
DATA ANALYZED : 27 SEPT 1979
SITE CODE : 00350
JOB CODE : 230
USER CODE : 4267
TRANSDUCER : [illegible]
TOTAL SAMPLES = 115200
STANDBY TIME = 0 HR 0 M

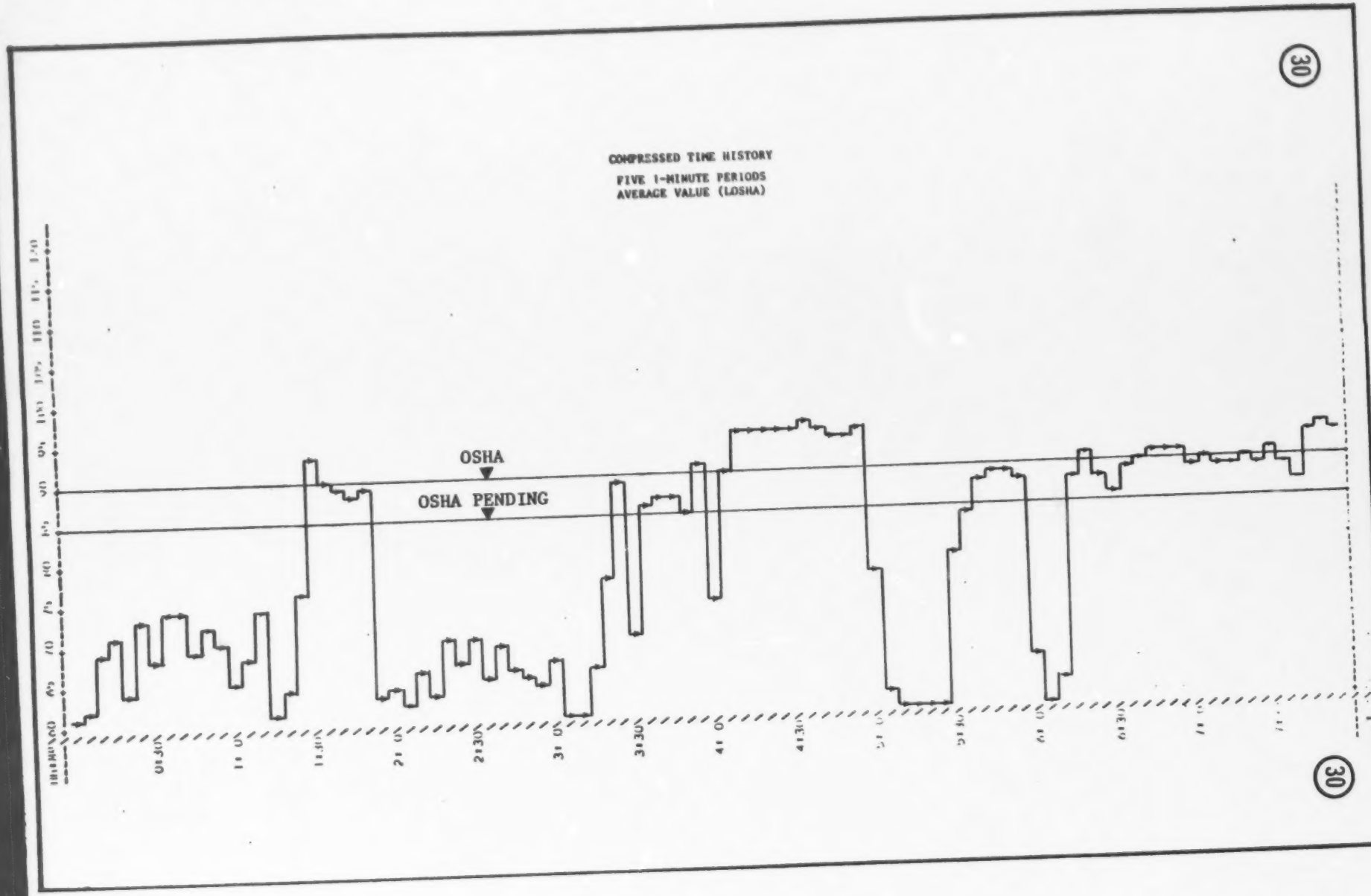
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
LOGGING LOSS = 90 DB / 8 HRS
EXCHANGE (DOUBLED) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 50 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		LOGIC	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	70.2	70.2	.802	.80
2	84.2	80.2	5.583	6.38
3	66.2	77.7	.358	6.84
4	83.4	79.6	4.985	11.83
5	93.9	85.4	21.366	33.19
6	82.4	85.0	4.387	37.58
7	87.5	85.4	8.899	46.48
8	90.9	86.3	13.476	59.96

MIN. COMP. = 60 DB MAX. COMP. = 97 DB
ARITHMETIC MEAN = 77 DB
STD. DEVIATION = 14 DB
VARIANCE = 190 DB


FREQUENCY DISTRIBUTION
FREQUENCY
GROUP
NUMBER
PER CENT
60 TO 64
65 TO 69
70 TO 74
75 TO 79
80 TO 84
85 TO 89
90 TO 94
95 TO 99
100 TO 104
105 TO 109
110 TO 114
115 TO 119
139 30.0
43 9.3
48 10.3
13 2.8
11 2.4
79 17.0
93 20.0
38 8.2
0 0.0
0 0.0
0 0.0
0 0.0
TOTAL NO. OF DATA POINTS = 464
30
30
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


30
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
30

(31)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1219    60    64     4     1
        92      115200  480
 68  71  75  76  67  60  60  62  60  62  60  60  63  60  64  81
 78  82  76  70  73  64  75  81  66  64  69  60  71  63  66  62
 65  60  77  65  63  68  60  70  61  77  70  77  72  69  79  76
 72  70  72  69  81  60  60  60  60  61  60  60  60  60  68  62
 69  73  65  76  64  85  89  85  78  81  83  87  79  88  82  82
 85  75  80  84  85  79  80  83  86  93  92  91  89  89  89  92
 90  88  84  90  84  86  90  90  85  86  90  84  74  60  62  62
 60  65  60  61  66  60  60  69  72  63  62  61  68  63  60  73
 61  60  75  72  67  60  70  66  76  80  79  76  73  66  60  64
 60  61  62  65  61  60  62  60  60  60  60  80  82  83  83  86
 93  87  96  97  96  98  92  98  97  97  96  96  96  97  96  90
 91  90  91  90  92  91  91  90  93  92  93  91  90  84  80  74
 86  89  89  89  87  89  81  82  72  71  86  76  80  91  77  80
 79  80  79  80  80  75  80  80  78  80  84  87  86  86  86  85
 89  96  97  96  94  95  94  95  94  82  60  80  78  73  78  90
 94  92  92  93  87  91  92  60  60  60  62  72  74  70  74  66
 60  67  60  68  86  95  97  97  97  87  77  90  97  95  94  94
 93  91  91  91  92  92  90  91  92  92  91  91  86  75  77  78
 76  74  70  62  60  60  60  60  60  60  60  60  66  64  86  88
 60  60  60  60  60  60  60  60  60  74  85  90  94  85  81  83
 84  96  95  94  91  92  91  90  89  91  92  90  90  92  91  91
 91  92  91  92  90  93  92  91  91  89  91  89  91  92  90  89
 93  92  91  90  90  89  89  94  92  91  90  92  90  93  90  92
 92  92  91  90  88  86  89  90  92  90  92  91  92  91  90  91
 89  89  90  93  92  87  74  76  75  77  77  79  77  66  73  71
 74  67  71  73  75  70  78  74  78  92  93  90  92  91  84  92
 96  94  94  93  89  91  92  93  95  94  84  90  96  95  95  92
 91  93  91  92  77  60  75  88  77  87  93  97  96  94  85  86
 94  96  97  96  94  94  94  92  94  94  93  94  93  95  94  92
 94  95  93  93  93  95  92  93  96  94  93  94  95  94  92  78
%EOF
```

(31)

```
ENTER LOG DATE (DD/MM/YR) : 11/09/79
ENTER SITE CODE (5 CHARS) : 00351
ENTER USER CODE (4 CHARS) : 4621

 ENTER JOB CODE (3 CHARS) : 230
```

```
    DATA LOGGED :11 SEPT 1979
         LOGGER : DB-301/26
SERIAL NUMBER : 1219
       BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION =   8 HR 0 S

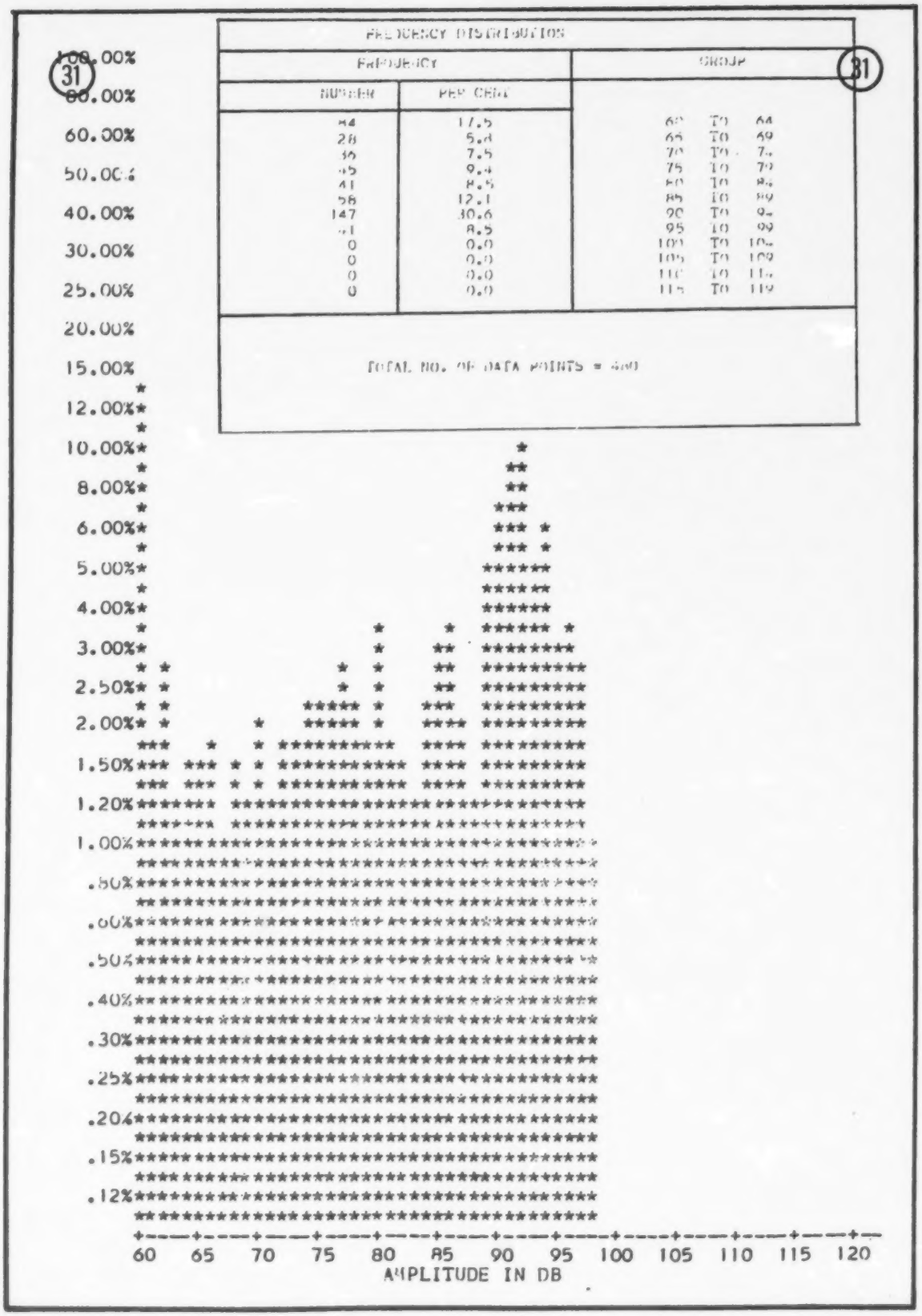
DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 00351
     JOB CODE : 230
    USER CODE : 4621
   THRESHOLD : 80 DB
TOTAL SAMPLES =  115200
STANDBY TIME =   0 HR 0 S
```

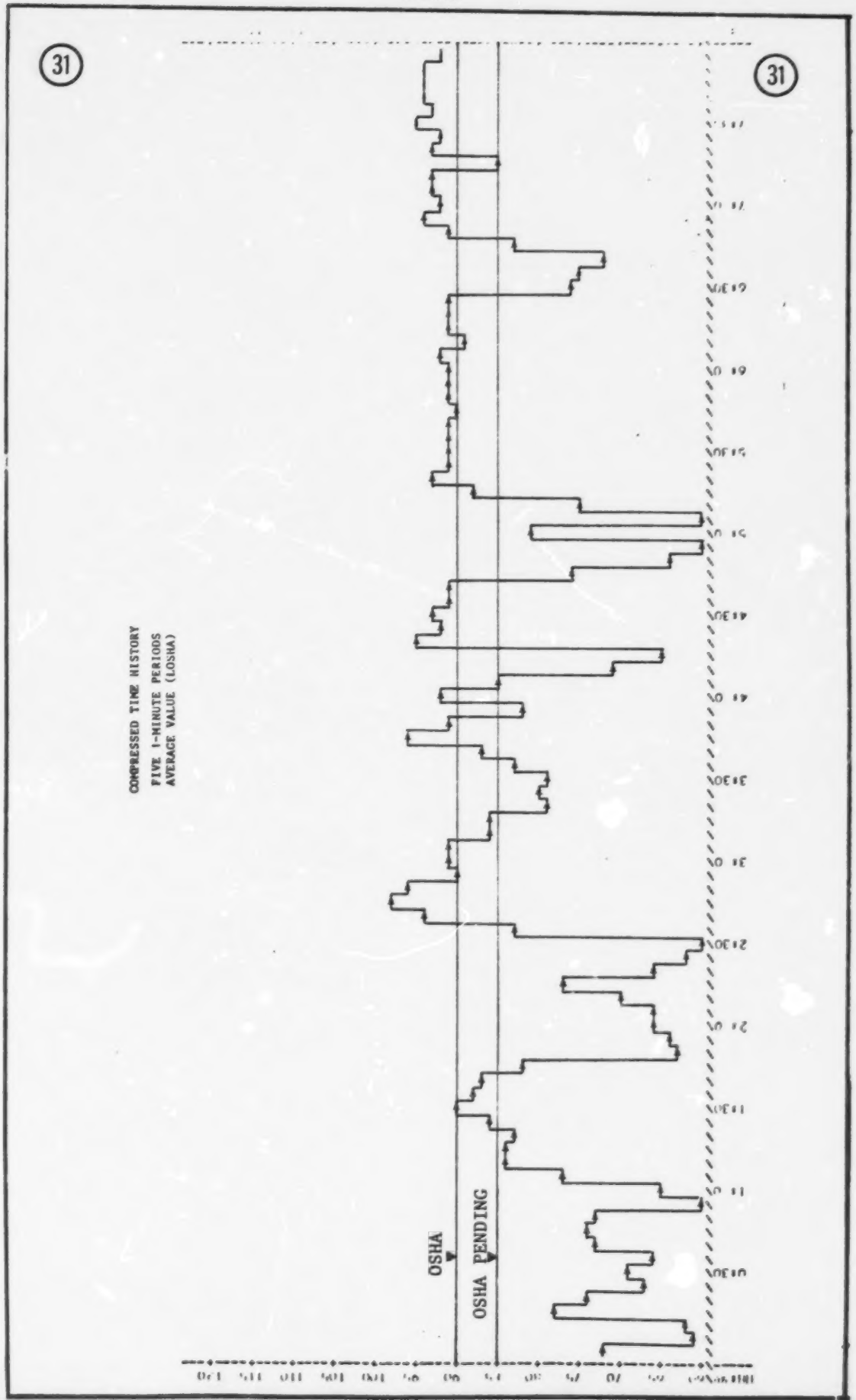
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	71.2	71.2	.923	.92
2	83.5	79.7	5.110	6.03
3	87.8	84.5	9.250	15.28
4	87.8	84.9	9.212	21.50
5	88.1	85.6	9.635	34.13
6	89.2	86.4	11.221	45.35
7	90.8	86.8	10.602	55.95
8	92.0	87.9	18.425	74.38

MIN. COMP. = 60 DB MAX. COMP. = 98 DB
ARITHMETIC MEAN = 81 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB


FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
31
31
84 17.5 60 TO 64
28 5.8 65 TO 69
36 7.5 70 TO 74
45 9.4 75 TO 79
41 8.5 80 TO 84
58 12.1 85 TO 89
147 30.6 90 TO 94
41 8.5 95 TO 99
0 0.0 100 TO 104
0 0.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
100.00%
90.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


31
31
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(32)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1220    60    64     4     1
       31      115200   480
  60  62  65  60  60  60  60  60  64  68  67  63  60  69  60  60
  60  60  60  60  60  60  60  69  74  79  67  65  60  60  60  60
  60  60  60  66  60  66  62  60  60  60  60  62  85  85  85  88
  86  85  87  89  88  92  92  92  92  92  90  88  88  89  88  88
  86  81  85  87  87  86  86  85  85  86  85  79  69  81  85  84
  90  90  91  92  89  89  88  88  88  71  78  89  85  88  88  84
  88  89  87  93  88  87  89  92  96  90  93  97  91  94  88  73
  81  85  84  84  84  88  83  89  81  64  85  81  83  69  60  72
  64  60  84  83  84  85  95  91  93  87  90  88  86  87  88  84
  94  89  86  86  87  87  87  86  85  85  87  86  86  86  85  85
  85  85  85  86  86  86  86  85  86  87  86  84  74  63  82  89
  90  89  85  86  87  94  99  88  78  90  85  93  94  92  91  74
  66  62  62  72  66  82  81  96  93  85  85  83  81  83  86  89
  86  87 100  87  88  88  89  87  87  97  86  84  84  83  84  96
  86  89  94  82  85  81  78  76  77  74  69  75  69  77  78  90
  79  85  91  95  95  96  96  96  95  96  95  96  96  96  96  96
  96  96  96  96  96  96  96  96  96  91  86  81  82  82  94  92
  84 104  99 105  70  66  60  60  78  78  62  60  60  65  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  84  82  85  89  96  92  98  90  91  91  94  88
  90  79  83  87 109 105 111 113 112 112 112 103  90  87  78  82
  85  96 116 116  92  82 113 113 112 111 112 111 111 111 111 109
  82 110 112 112 112 112 112 111 111 111 111 105  84  89 111 112
 111 111 111 111 111 111 111 111 111 102 109 112 112 111 111 111
 111 111 111 111 111 105 101 112 111 103  86  88  82  88  91  85
  85  83  80  82  76  92  77  82  82  60  60  77  65  60  60  60
  60  60  60  60  60  60  60  60  77  64  60  60  60  60  60  60
  60  73  87  89  89  78  89  90  96  90  81  81  75  78  60  72
  61  60  80  74  63  70  60  65  60  63  61  66  60  60  63  83
  60  80  66  63  65  61  76  73  79  61  60  60  61  60  60  62
4L0F
```

(32)

```
ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : 120EE
ENTER USER CODE (4 CHARS) : 4710
 ENTER JOB CODE (3 CHARS) : 241

   DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : 04-301/26                 SITE CODE : 120EE
SERIAL NUMBER : 1220                       JOB CODE : 241
     BASELINE : 60 DB                     USER CODE : 4710
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 Db
SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
TEST DURATION = 8 HR 0 M 0          STANDBY TIME =  0 H 0 M 7

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TRADE OFF = 90 DB / 5 DBS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 Db
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

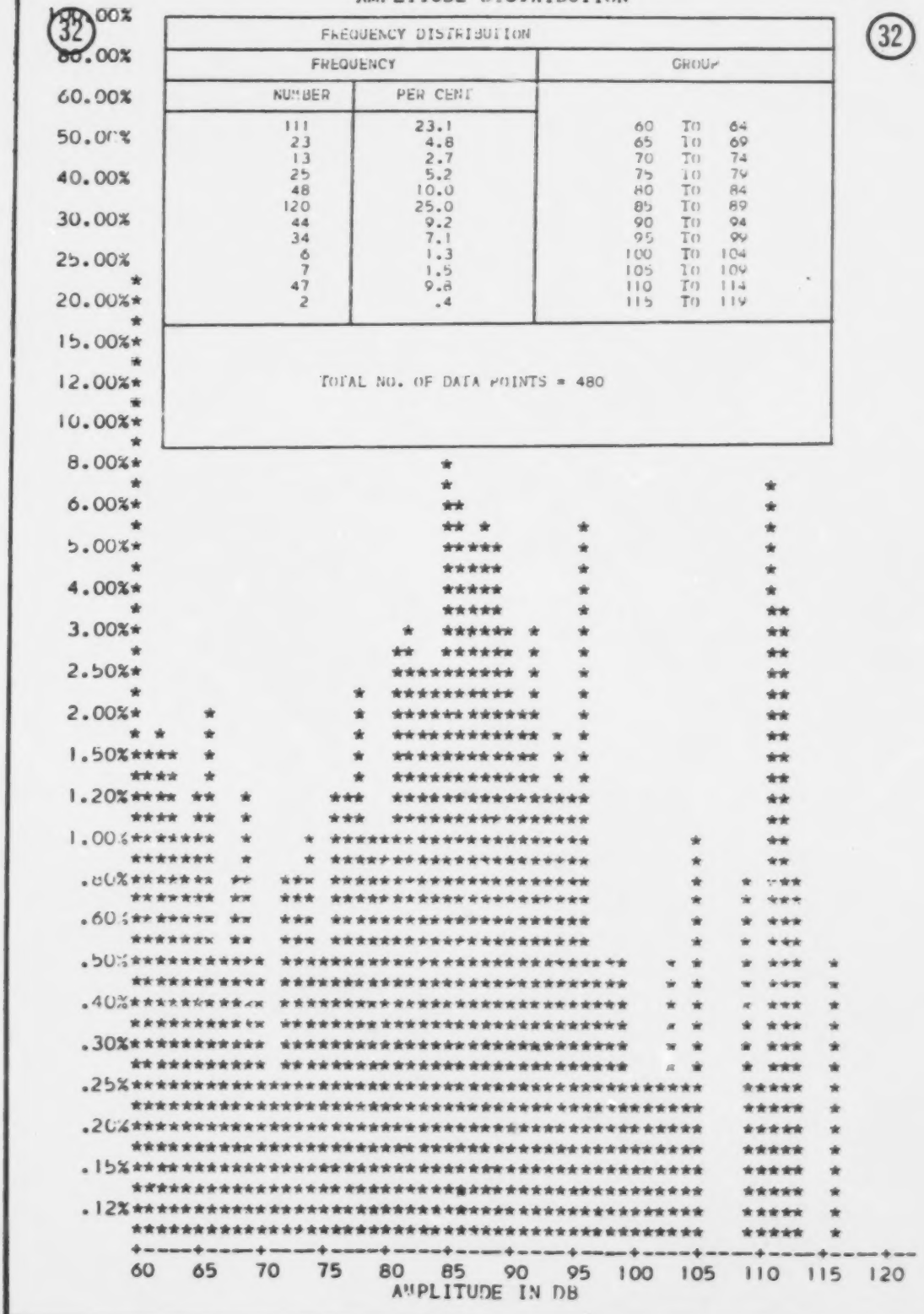
TIME          LEVEL                    DOSE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1      80.3      80.3          3.236      3.24
   2      88.0      85.1          9.483     12.72
   3      86.1      85.4          7.233     19.95
   4      87.8      86.1          9.193     29.15
   5      91.7      87.6         15.726     44.87
   6     106.2      95.6        118.381    163.25
   7     105.9      98.3        113.357    276.61
   8      77.9      97.4          2.335    278.94
MIN. COMP. =  80 DB              MAX. COMP. = 116 DB
ARITHMETIC MEAN =  92 DB
STD. DEVIATION =  16 DB
VARIANCE =  [illegible] DB
```

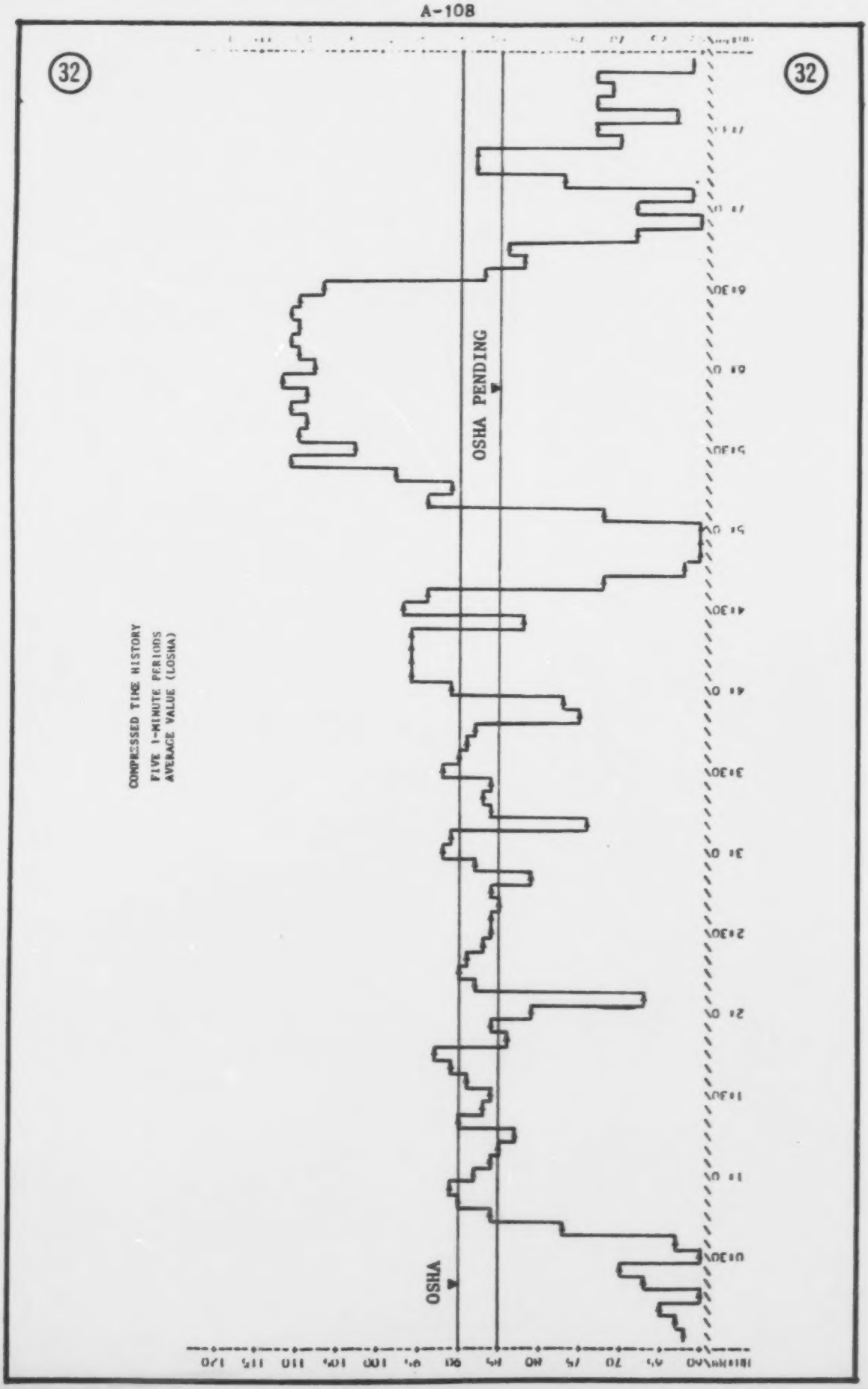
AMPLITUDE DISTRIBUTION

(32) (32)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
111	23.1	60 TO 64
23	4.8	65 TO 69
13	2.7	70 TO 74
25	5.2	75 TO 79
48	10.0	80 TO 84
120	25.0	85 TO 89
44	9.2	90 TO 94
34	7.1	95 TO 99
6	1.3	100 TO 104
7	1.5	105 TO 109
47	9.8	110 TO 114
2	.4	115 TO 119

TOTAL NO. OF DATA POINTS = 480




32
32
OSHA PENDING
OSHA
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(33)

```
 1  26  80  121n   60   64    4    1
     84      115200  480
 66  60  60  60  61  62  65  60  60  68  72  71  62  61  60  60
 63  61  61  62  60  60  60  60  60  60  60  62  60  60  60  60
 60  61  60  60  64  61  64  61  70  60  60  68  60  60  60  60
 60  60  60  66  73  84  91  70  62  65  72  86  85  92  86  86
 85  85  84  84  84  83  84  84  85  85  86  87  87  86  85  85
 85  85  85  85  85  85  85  85  85  84  84  85  85  85  85  85
 85  86  86  87  88  88  89  86  86  84  85  83  87  78  86  88
 88  88  88  88  88  88  90  89  90  91  90  90  90  90  89  89
 89  90  88  88  89  89  88  88  89  89  88  88  88  88  88  89
 90  90  91  92  91  92  92  94  94  93  93  92  78  69  80  79
 76  86  93  94  94  94  94  94  94  94  93  94  94  94  94  94
 95  96  84  83  82  82  82  82  79  73  76  68  74  61  60  65
 67  60  75  71  67  60  60  60  60  60  60  60  67  60  60  70
 67  62  63  61  60  60  65  68  63  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  61  62  60  60  60  60  60
 60  78  91  79  87  89  66  71  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  61  62
 86  88  76  91  83  60  60  60  60  68  61  62  69  60  60  60
 60  60  60  60  60  60  62  60  60  61  63  60  65  60  60  60
 60  60  60  60  60  60  61  62  60  60  62  60  60  60  60  60
 60  60  60  60  61  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  62  60
 60  60  60  60  60  60  60  60  60  60  60  60  64  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  61  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  61  64
 77  66  60  61  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  92  88  83  83  79  64  60  60  60  60
%EOF
```

(33)

```
ENTER LOG DATE (DD/MM/YR) : 25/07/79
ENTER SITE CODE (5 CHARS) : 00000

ENTER USER CODE (4 CHARS) : 7483
 ENTER JOB CODE (3 CHARS) : CON
```

```
   DATA LOGGED :25 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 00000
SERIAL NUMBER : 1218                       JOB CODE : CON
     BASELINE : 60 DB                    USER CODE : 7483
DYNAMIC RANGE : 34 DB                     THRESHOLD : 60 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
TEST DURATION = 8: 0: 0               STANDBY TIME =  3: 0:21
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ANSI (ASA) 0% EXCHANGE RATE
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CRITERION) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

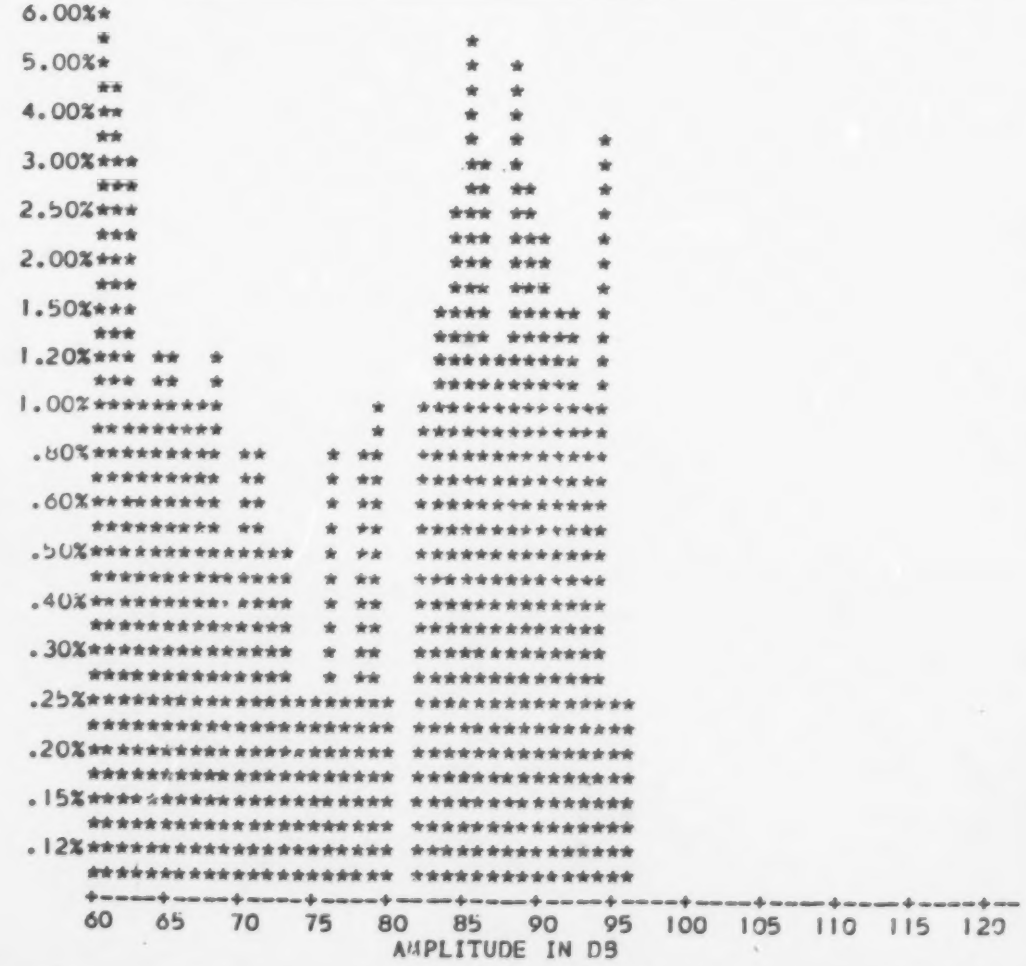
TIME	LEQ(A)		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	69.7	69.7	.754	.75
2	86.0	81.8	7.212	7.97
3	90.8	86.2	14.060	22.03
4	88.7	84.3	.854	22.88
5	74.5	83.1	1.457	24.34
6	60.6	81.9	.213	24.55
7	60.1	80.8	.199	24.75
8	70.7	80.1	.659	25.41

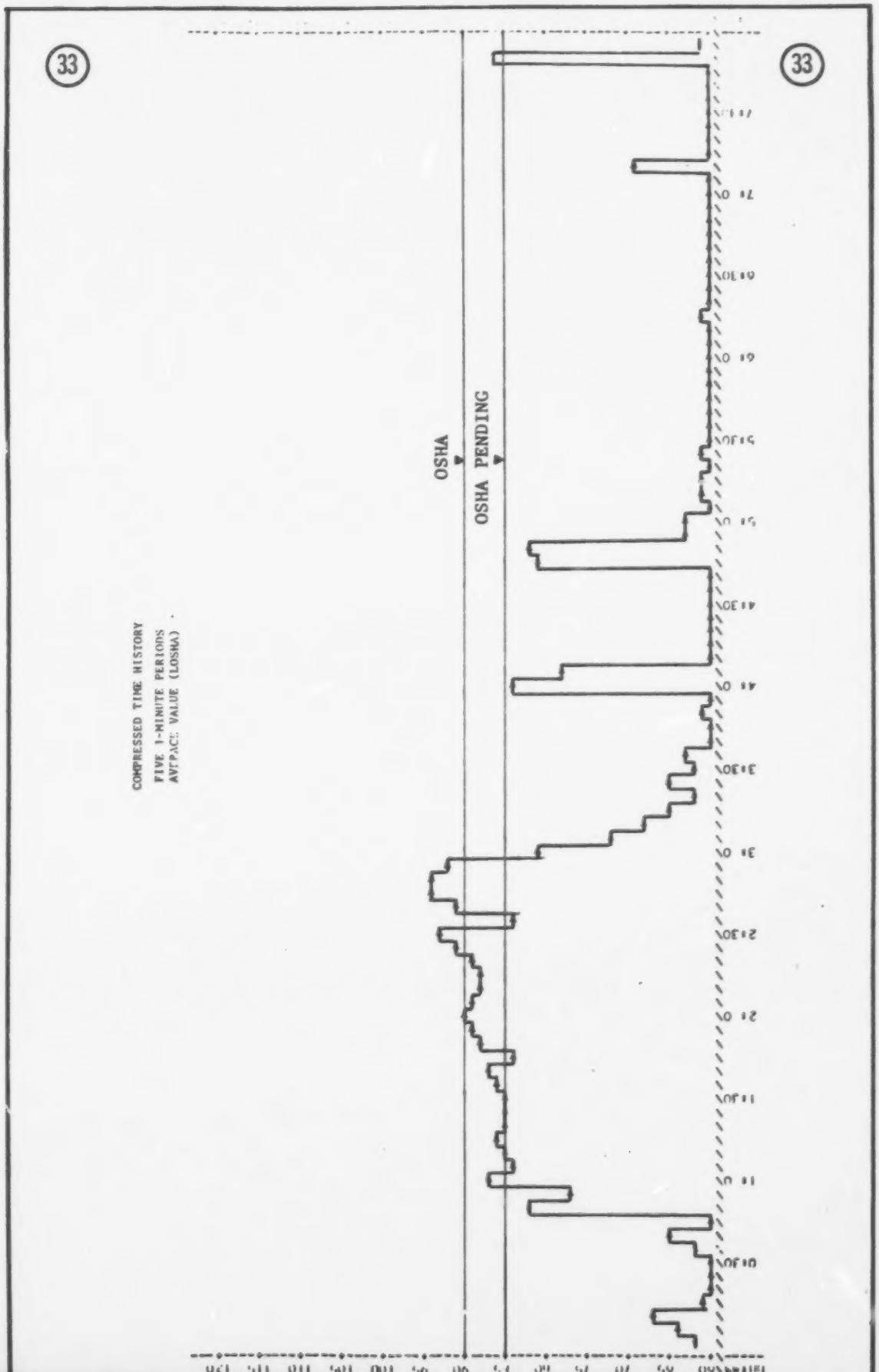
MIN. COMP. = 60 DB MAX. COMP. = 96 DB
ARITHMETIC MEAN = 85 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

AMPLITUDE DISTRIBUTION

(33) (33)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
304	63.3	60 To 64
20	4.2	65 To 69
11	2.3	70 To 74
12	2.5	75 To 79
21	4.4	80 To 84
71	14.8	85 To 89
39	8.1	90 To 94
2	.4	95 To 99
0	0.0	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119
TOTAL NO. OF DATA POINTS = 480		




33
33
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(34)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
 1  26  80  1217    60    64     4     1
      63     115200    499
 60  60  60  60  60  60  60  60  60  67  60  60  70  74  78  67
 71  68  63  63  82  83  62  72  75  77  75  80  77  84  88  80
 80  76  78  82  89  92  95  90  92  94  91  92  94  99  97  90
 93  95  96  94  95  95  95  95  91  97  98  93  96  97  97  91
 70  60  61  61  60  63  60  60  62  65  60  60  60  60  62  64
 60  72  67  61  60  66  65  60  60  75  71  69  70  75  71  72
 71  76  71  71  72  70  73  75  71  64  72  70  73  64  71  68
 76  60  75  60  60  66  85  77  60  60  76  75  65  70  81  78
 78  66  67  65  72  73  66  74  91  90  86  60  60  61  60  64
 91 112 110 105  99  94  77  60  65  71  92  95  81  60  62  94
 95  95 111 111  60  90  90  92  84  87  87  85  84  84  84  83
 83  83  81  81  81  79  78  67  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  61  60
 60  60  60  60  60  60  62  69  60  61  60  60  77  63  61  67
 67  68  67  63  67  60  60  62  65  69  82  81  62  82  85  87
 85  84  90  91  91  92  93  94  88  62  60  66  70  62  60  61
 60  67  60  62  60  61  62  60  65  64  65  62  63  62  60  72
 60  60  61  60  67  74  68  72  67  61  70  67  77  66  63  74
 82  68  71  73  78  82  82  80  78  78  74  81  83  77  82  79
 79  76  80  81  83  81  78  79  73  76  62  81  80  81  83  81
 81  84  83  82  84  85  83  83  81  81  81  81  81  80  76  80
 80  79  78  75  80  73  80  82  81  80  83  77  69  81  81  83
 77  82  81  80  78  75  81  82  83  81  82  81  81  79  80  66
 79  82  82  83  70  64  77  76  86  87  79  74  60  65  60  60
 62  60  61  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  71  61  61  61  60  67  65  74  68  61  60  69  66  60  60
 60  62  60  60  60  60  60  60  60  60  68  86  87  84  93  94
 91  95  91  91  98  92  96  93  93  78  66  60  61  61  61  60
%EOF
```

(34)

```
ENTER LOG DATE (DD/MM/YR) : 16/08/79
ENTER SITE CODE (5 CHARS) : 00000

ENTER USER CODE (4 CHARS) : 4222

 ENTER JOB CODE (3 CHARS) : C80
```

```
   DATA LOGGED :16  AUG 1979
        LOGGER : DB-301/26
SERIAL NUMBER : 1217
      BASELINE : 60 DB
DYNAMIC RANGE : 60 DB
SAMPLING RATE :  4/SEC
TEST DURATION =  8  0  0

DATA ANALYZED : 21 SEPT 1979
    SITE CODE : 00000
     JOB CODE : C80
    USER CODE : 4222
   THRESHOLD  : 85 DB
TOTAL SAMPLES = 115200
 STANDBY TIME =  0  0 15
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
DOSE RATE = 90 DB / 8 HRS
RECORDING (TRIGGER) LEVEL = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

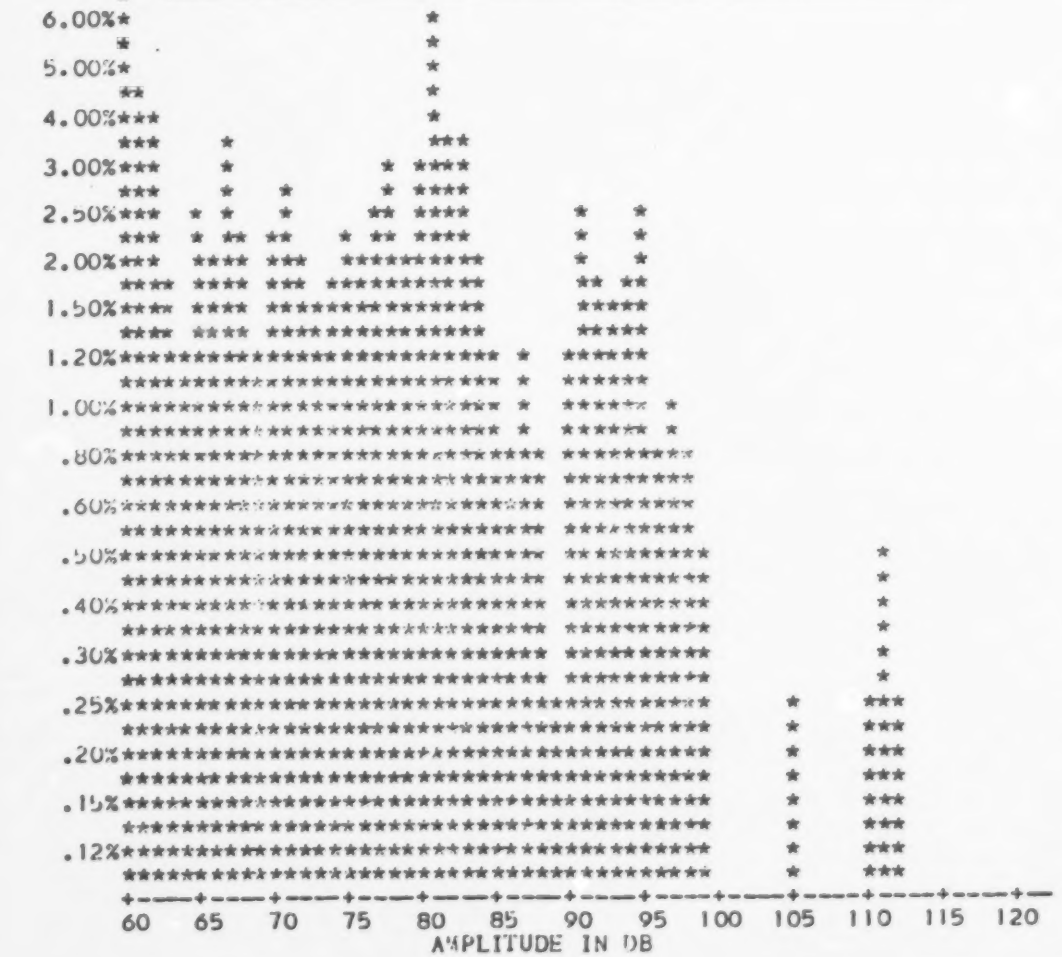
TIME HOUR	LOGA CURRENT	LOGA CUMULATIVE	DOSE CURRENT	DOSE CUMULATIV
1	86.4	86.4	10.092	10.09
2	78.5	85.0	2.531	12.58
3	94.6	89.7	23.578	36.16
4	84.9	87.7	.954	36.56
5	79.1	86.1	2.744	39.29
6	79.6	85.9	2.973	42.26
7	76.9	85.1	2.029	44.29
8	82.5	84.8	4.437	48.73

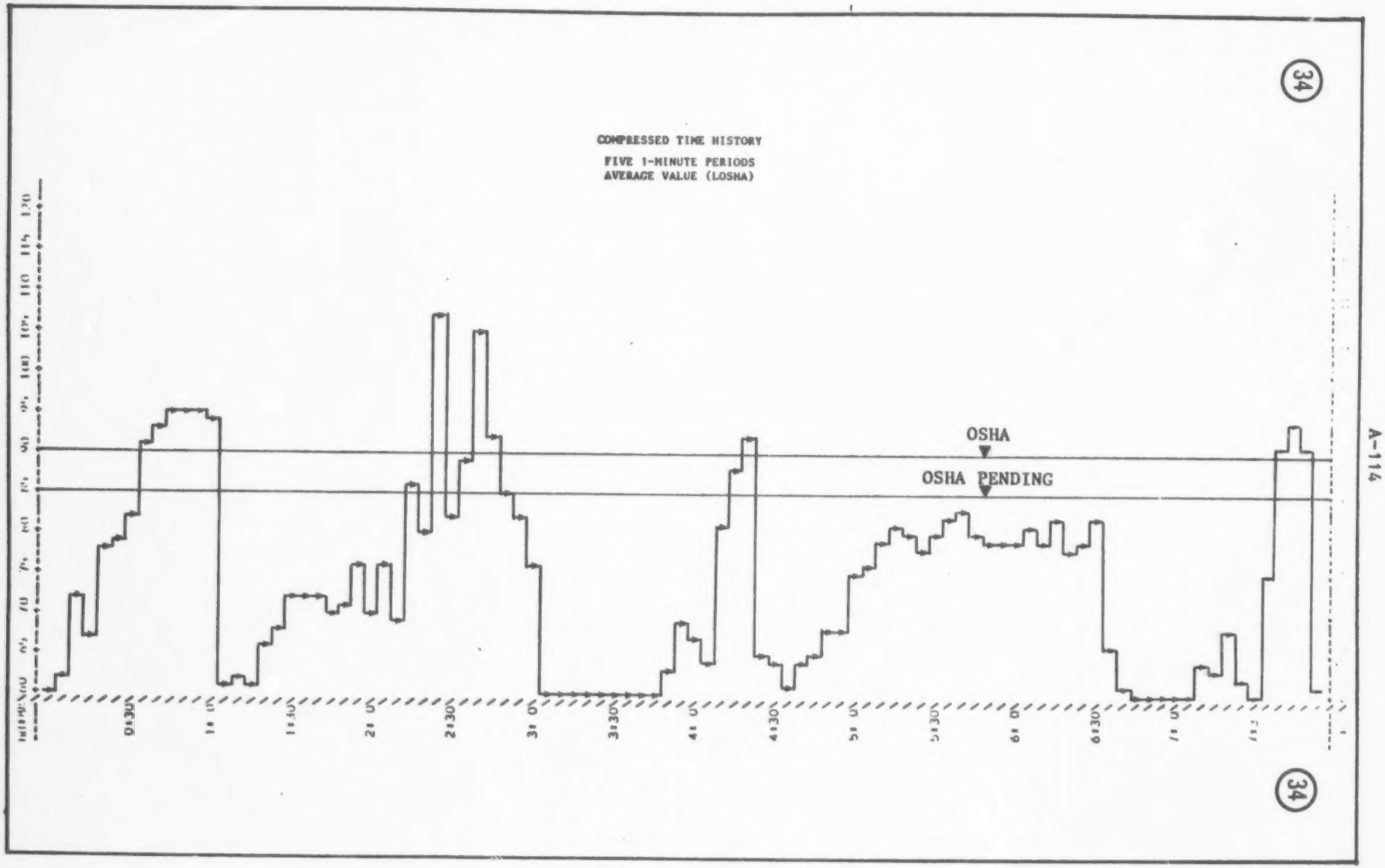
MIN. COMP. = 60 DB
MAX. COMP. = 112 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

AMPLITUDE DISTRIBUTION

(34) (34)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
190	39.6	60 TO 64
47	9.8	65 TO 69
41	8.5	70 TO 74
47	9.8	75 TO 79
76	15.8	80 TO 84
17	3.5	85 TO 89
35	7.3	90 TO 94
22	4.6	95 TO 99
0	0.0	100 TO 104
1	.2	105 TO 109
4	.8	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




34
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
34

(35)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1213    60    64     4     1
     24      115200   480
  60  60  60  61  73  63  64  64  60  61  60  61  61  60  62  60
  60  60  63  60  60  60  60  60  66  69  62  64  64  65  64  56
  60  69  60  60  75  60  74  72  76  70  71  60  64  60  62  60
  60  64  63  63  66  63  60  75  71  60  63  71  70  78  81  68
  62  64  60  62  60  60  60  60  60  60  60  60  69  71  60  60
  60  60  60  60  60  70  69  72  60  60  60  60  60  63  60  60
  60  60  60  62  60  60  66  60  60  60  60  60  63  60  60  70
  60  60  60  72  78  60  60  90  82  63  60  64  67  63  60  60
  61  60  60  60  90  87  86  86  68  61  60  60  60  65  60  60
  60  60  60  60  60  60  60  93  91  66  66  86  67  86  66  66
  79  60  60  60  60  78  74  67  65  84  79  86  86  87  91  91
  65  60  71  60  85  74  60  67  60  60  60  60  79  60  63  65
  61  75  60  60  61  61  65  60  62  68  61  68  60  60  60  60
  60  60  60  60  64  88  60  60  60  60  60  60  83  84  85  84
  83  83  66  76  74  70  66  64  77  67  63  80  94  62  78  60
  60  71  70  62  69  72  66  69  67  60  60  62  61  63  60  73
  63  62  70  63  62  62  67  73  64  64  60  60  63  60  65  68
  67  69  60  60  63  66  68  60  61  68  63  62  60  60  60  60
  60  60  50  65  63  66  66  78  67  76  74  61  79  60  60  62
  75  79  71  69  92  95  92  86  71  62  60  60  60  61  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  61  62  60  67  63  71  67  65  61  92  91  87  93
  76  90  72  89  60  60  60  60  62  60  62  60  66  60  62  60
  60  60  60  60  60  60  60  60  60  62  63  61  60  60  70  82
  89  90  87  75  65  60  60  60  60  60  60  62  75  60  60  60
  60  65  60  62  60  60  60  60  60  60  60  60  60  60  61  64
  60  60  65  64  77  66  68  66  66  62  60  60  60  62  63  68
  71  78  60  72  90  75  64  92  99  99 101 100  98  89  86  83
  83  96  91  69  80  80  75  83  71  61  63  82  95  93  95  73
  64  64  61  63  61  60  64  63  60  62  61  60  60  60  60  68
%EOF
```

(35)

```
ENTER LOG DATE (DD/MM/YR) : 16/08/79
ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 4077
 ENTER JOB CODE (3 CHARS) : C80
```

```
   DATA LOGGED :16  AUG 1979          DATA ANALYZED : 21 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : 00000
SERIAL NUMBER : 1213                      JOB CODE : C80
     BASELINE : 60 DB                     USER CODE : 4077
DYNAMIC RANGE : 64 DB                     RESOLUTION : 8 BITS
SAMPLING RATE : 4/SEC                  TOTAL SAMPLES =  115200
TEST DURATION =  8 HR 0 MIN 0          STARTED TIME =  10 00 A
```

TIME HISTORY ANALYSIS

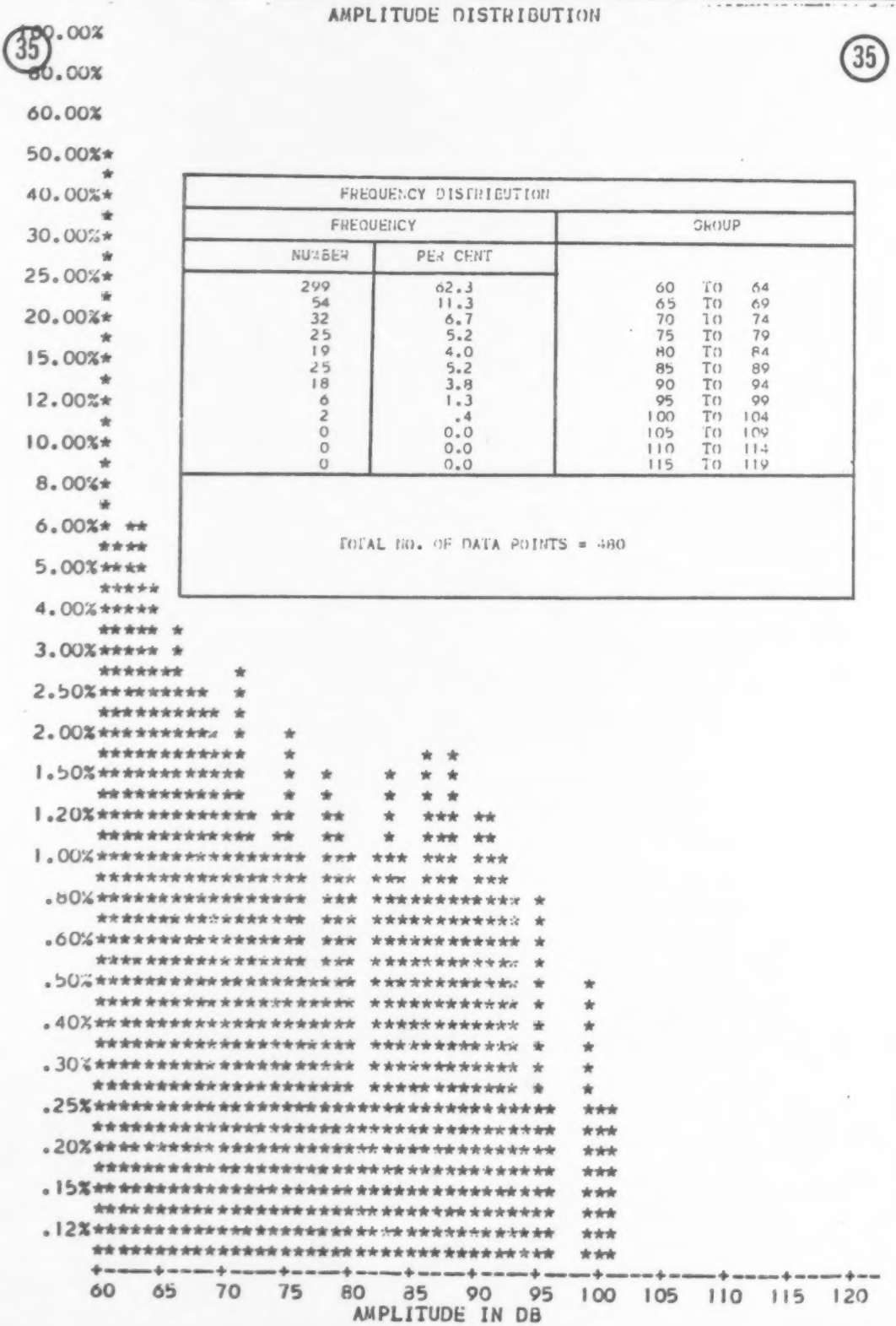
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
SPL WAS MEASURED ON THE [illegible]
DOSE POINT = [illegible]
EXCHANGE (DOUBLING) RATE = [illegible]
THRESHOLD (STARTING) LEVEL = [illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	TOTAL		TIME	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	67.6	67.6	.560	.56
2	69.0	68.3	.678	1.24
3	61.0	79.2	3.570	4.81
4	75.3	71.2	1.620	6.43
5	66.4	74.1	.471	6.90
6	79.3	75.3	2.855	9.76
7	70.1	74.8	.861	10.62
8	69.6	77.4	6.819	17.44

MIN. CORR. = 60 DB MAX. CORR. = 101 DB
ARITHMETIC MEAN = 66 DB
STD. DEVIATION = 10 DB
VARIANCE = 100 DB

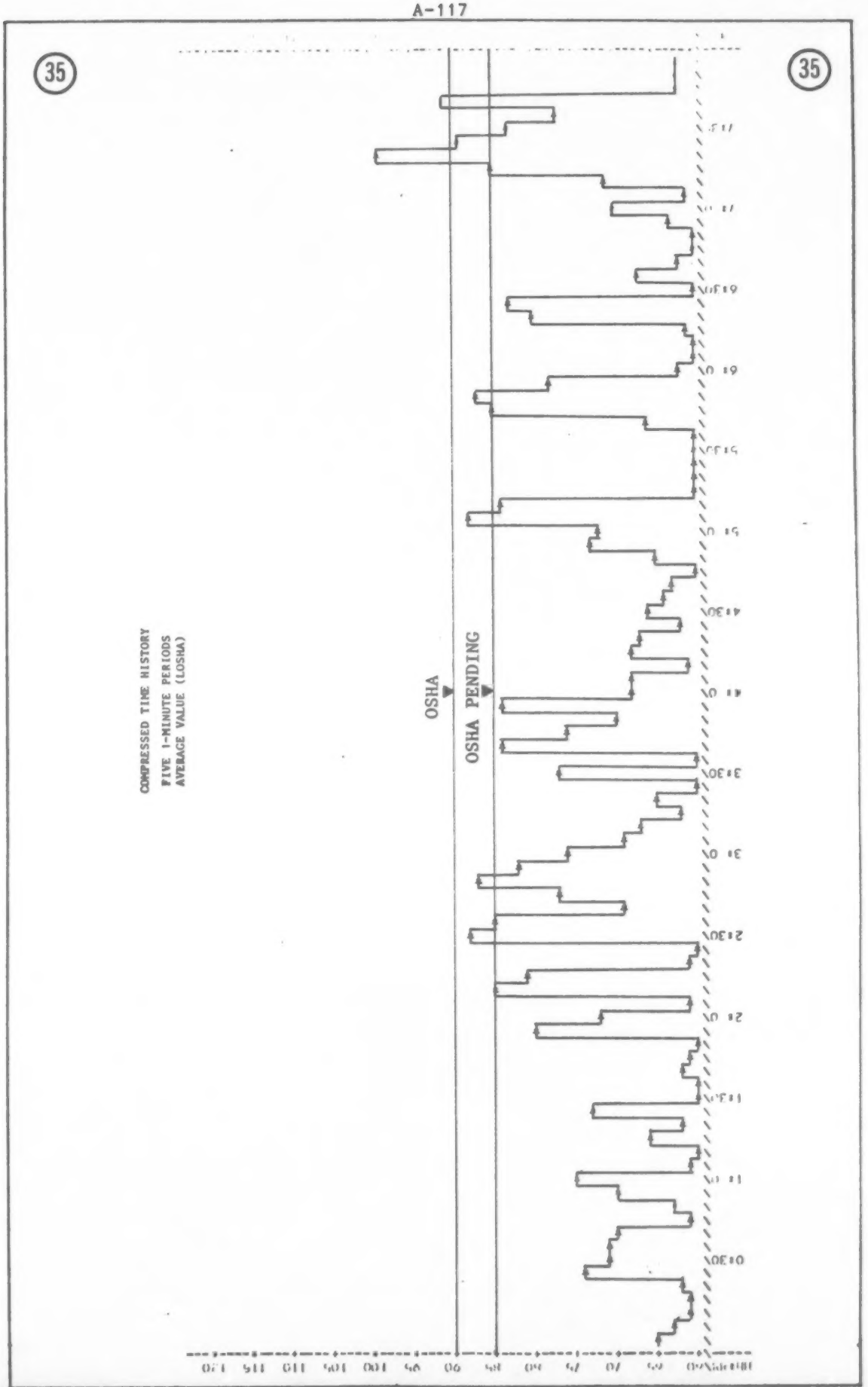
AMPLITUDE DISTRIBUTION

(35) (35)



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
299	62.3	60 TO 64
54	11.3	65 TO 69
32	6.7	70 TO 74
25	5.2	75 TO 79
19	4.0	80 TO 84
25	5.2	85 TO 89
18	3.8	90 TO 94
6	1.3	95 TO 99
2	.4	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


35
35
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
70
75
80
85
90
95
100
105
110
115
120

(36)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  20  80  1226    60    64     4     1
     96      115200  480
 60  63  64  60  60  60  60  60  60  60  60  60  60  68  62  60
 60  68  60  65  60  60  60  62  60  60  60  69  63  60  63  82
 72  73  80  81  91  95  65  65  72  89  85  83  60  70  71  60
 63  60  61  62  62  62  64  63  60  64  83  84  62  63  71  72
 73  79  75  63  71  75  67  64  73  67  60  78  70  73  63  72
 72  66  61  71  64  72  65  71  75  73  61  74  60  61  61  64
 80  67  69  83  83  92  90  85  78  82  67  64  64  75  79  76
 83  80  76  76  75  84  81  71  75  93  99  77  79  84  83  81
 84  82  86  86  84  85  85  87  78  79  78  84  79  76  84  83
 83  83  85  84  86  81  86  91  91  .  90  92  81  85  85  1
 68  89  91  90  87  89  85  89  86  87  78  73  70  83  89  74
 67  98  98  94  95  91  85  85  92  87  94  91  96  91  91  96
 79  79  85  72  73  76  67  65  87  79  79  75  .  81  85  73
 82  85  75  69  83  83  86  87  85  85  89  96  77  90  87  87
 90  89  90  95  93  93  84  88  97  93  93  95  82  93  92  90
 96  97  94  98  92  98  93  89  80  91  75  72  60  81  82  82
 69  68  71  65  60  69  61  60  65  68  62  65  64  60  60  60
 61  65  71  62  70  60  63  61  67  68  61  63  66  62  64  60
 60  60  60  60  61  61  68  65  65  71  81  91  89  78  84  94
 62  68  60  66  75  62  68  67  92  96  92  89  77  70  64  60
 60  60  60  60  60  60  69  60  65  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  75  78  61  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  64
 60  60  60  60  60  61  64  72  71  70  66  68  69  77  66  68
 71  84  76  74  69  76  95  93 102  80  78  66  68  60  62  80
 82  73  72  80  68  61  60  77  65  64  60  76  60  60  66  68
 67  77  73  60  62  60  78  91  60  69  97  98  95 103  99  93
 89  83  87  84  97  96  92  99  99  87  71  70  60  68 174  78
 65  74  69  60  62  63  60  60  60  65  60  62  64  63  66  61
%EOF
```

(36)

```
ENTER LOG DATE (DD/MM/YR) : 16/08/79
ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 7919
 ENTER JOB CODE (3 CHARS) : C80
```

```
   DATA LOGGED :16  AUG 1979          DATA ANALYZED : 21 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 00000
SERIAL NUMBER : 1226                       JOB CODE : C80
     BASELINE : 60 DB                     USER CODE : 7919
DYNAMIC RANGE : 64 DB                    THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STARTED AT =  01:03:24
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOO LOUD = 20 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

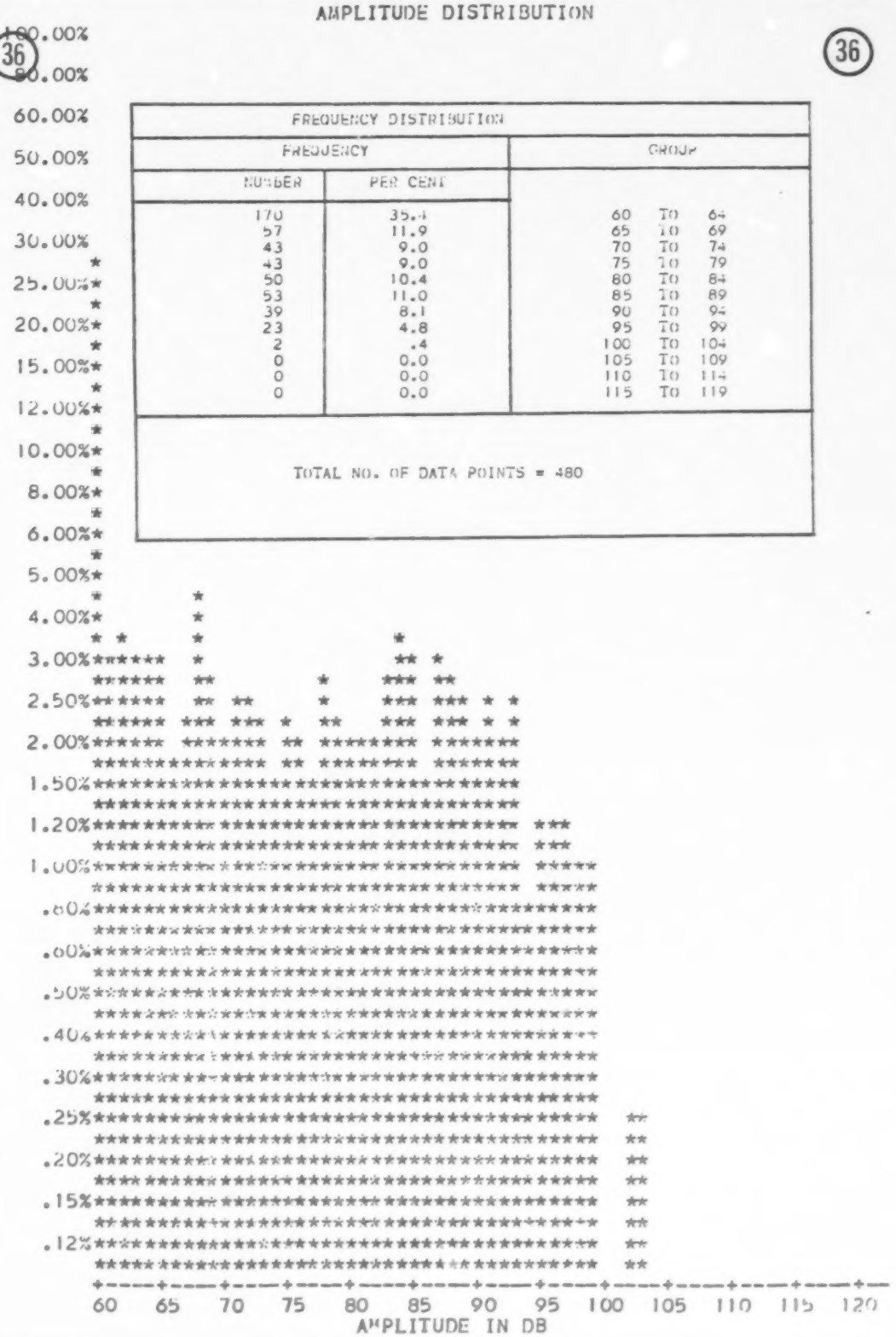
HOUR	LOUD CURRENT	LOUD CUMULATIVE	DOSE CURRENT	DOSE CUMULATIVE
1	75.4	75.4	1.652	1.65
2	79.6	77.8	2.957	4.61
3	81.6	82.0	7.793	12.40
4	86.6	84.3	10.303	22.70
5	82.1	83.9	4.176	26.88
6	78.4	83.2	2.497	29.38
7	78.8	82.7	2.649	32.03
8	86.8	83.4	7.972	40.01

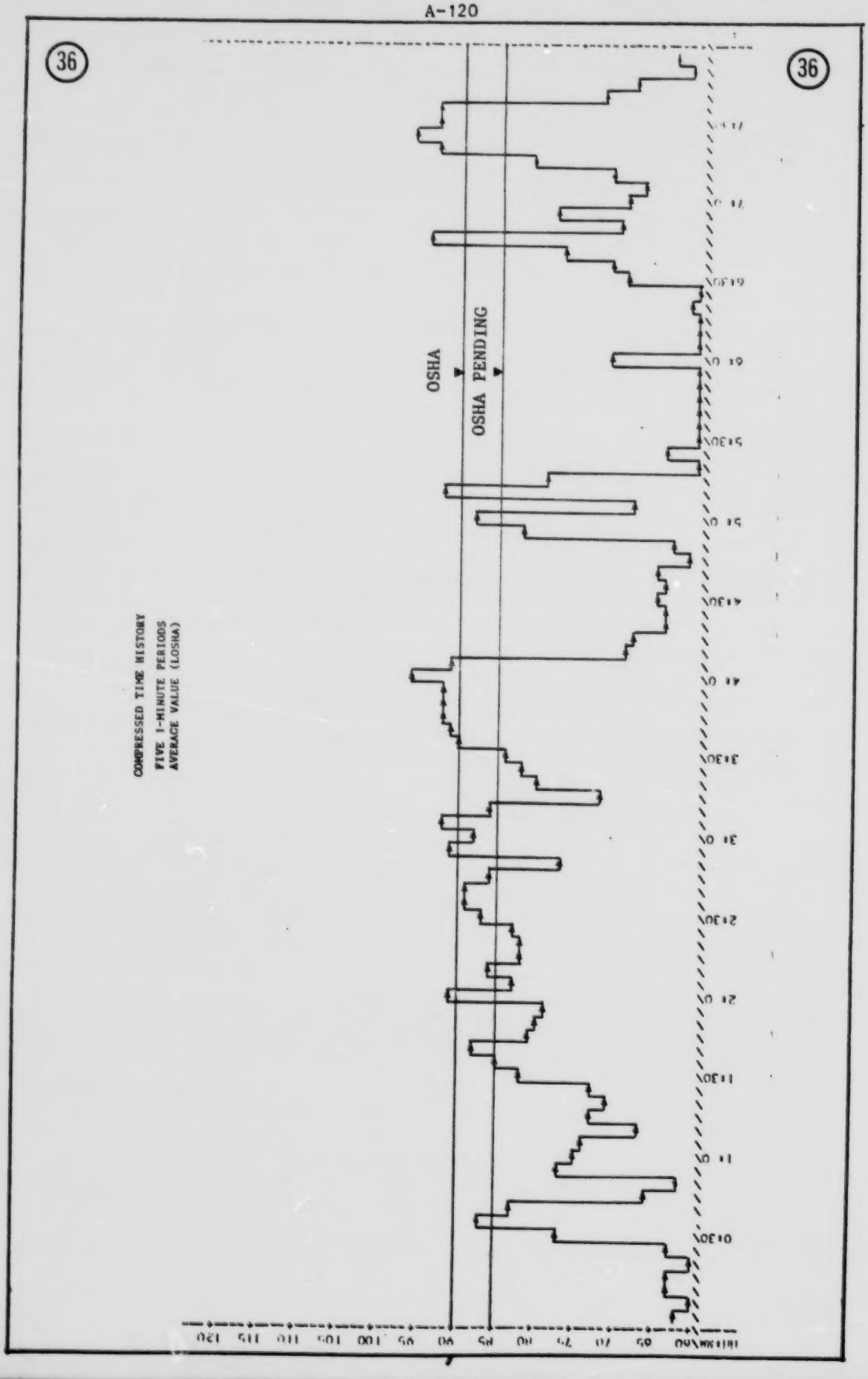
```
MIN. COMP. =  60 DB                MAX. COMP. = 103 DB
ARITHMETIC MEAN =  73 DB
STD. DEVIATION =  12 DB
VARIANCE =144 DB
```

AMPLITUDE DISTRIBUTION

(36) (36)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
170	35.4	60 TO 64
57	11.9	65 TO 69
43	9.0	70 TO 74
43	9.0	75 TO 79
50	10.4	80 TO 84
53	11.0	85 TO 89
39	8.1	90 TO 94
23	4.8	95 TO 99
2	.4	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




36
36
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(37)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1220   60   64    4    1
     129     115200  480
 61  60  60  60  60  60  60  65  61  60  60  60  67  60  65  60
 67  60  64  61  62  60  65  60  65  64  61  61  60  64  66  74
 71  67  60  60  60  61  60  61  60  61  78  71  76  71  73  71
 66  65  77  67  74  75  84  76  79  72  70  71  67  64  67  62
 60  60  60  62  66  65  70  82  69  79  77  80  69  60  60  70
 64  64  60  73  79  69  76  79  82  82  75  79  75  70  69  66
 72  71  72  84  76  77  72  65  60  58  65  70  76  69  63  65
 60  60  60  60  60  64  70  68  68  85  80  84  74  60  60  60
 60  60  69  86  86  80  82  88  99  98  87  86  86  86  93  84
 89  93  75  78  73  75  77  71  77  90  92  84  80  81  79  75
 86  79  72  60  62  60  72  71  60  60  60  60  72  66  60  60
 60  77  90  61  60  60  60  62  65  70  75  78  71  66  60  60
 60  60  72  67  62  60  70  73  74  76  63  72  63  64  66  70
 92  85  66  77  76  77  62  60  61  72  73  76  60  60  60  60
 60  60  60  65  60  63  65  89  90  89  92  86  85  86  89  90
 86  86  86  86  90  91  70  60  67  76  64  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  61
 60  60  60  60  60  60  60  60  64  60  60  60  60  64  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  65  67  62  83  72  61  60  70  62  63  60  73  60  60  75
 78  60  60  60  60  60  60  60  60  60  60  60  60  60  61  60
 60  60  60  60  60  60  60  92  91  89  88  69  60  60  93  60
 63  60  71  60  60  60  60  72  60  68  60  60  60  60  69  81
 60  60  60  84  77  60  60  60  78  61  60  60  60  66  60  60
 60  60  60  61  60  72  89  88  70  85  73  60  60  70  68  72
 71  60  61  62  68  65  60  60  60  77  70  69  60  60  60  67
 60  67  70  60  60  60  67  72  80  60  62  74  90  87  87  84
 83  84  81  76  66  65  72  83  90  96  98  96  97  99  92  72
%EOF
```

(37)

```
ENTER LOG DATE (DD/MM/YR) : 24/08/79
ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 0816
 ENTER JOB CODE (3 CHARS) : 132
```

```
    DATA LOGGED :24  AUG 1979          DATA ANALYZED : 25 SEPT 1979
         LOGGER : DE-301726                 SITE CODE : 00000
  SERIAL NO.&B  : 1220                       JOB CODE : 132
       BASELINE : 60 DB                     USER CODE : 0816
  DYNAMIC RANGE : 64 DB                    TIME CODE :
  SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
  RES. BANDWIDTH =  .98 OCTAVE          STABILITY TIME =  1.0832
```

TIME HISTORY ANALYSIS

```
.01 SECOND EQUIVALENT LEVEL (E.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING
DATA SET = 2 MINUTES / 480
WEIGHTED (CORRECTED) AVG = 5.73
WEIGHTED (CORRECTED) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

1	LOG		SQUARE	
MODE	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	68.9	68.9	.674	.67
2	73.6	71.6	1.249	1.96
3	73.0	71.8	5.120	7.08
4	76.1	72.2	2.593	9.66
5	73.2	72.4	1.223	10.90
6	69.0	72.3	.388	11.29
7	72.4	72.2	1.615	12.90
8	73.9	72.6	5.123	18.02

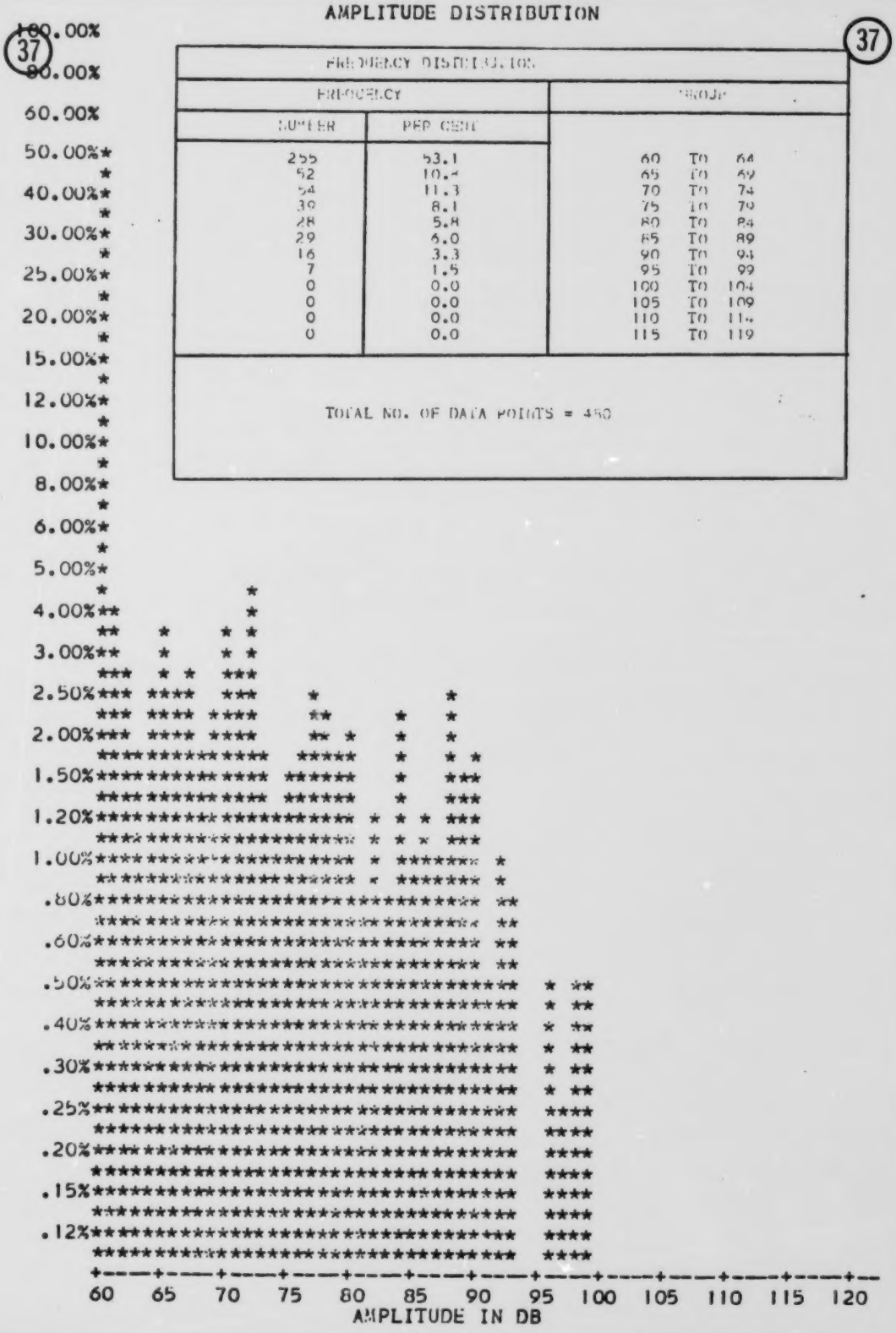
```
MIN. COMP. =  60 DB                 MAX. COMP. =  99 DB
ARITHMETIC MEAN =  66 DB
STD. DEVIATION =  10 DB
VARIANCE =100 DB
```

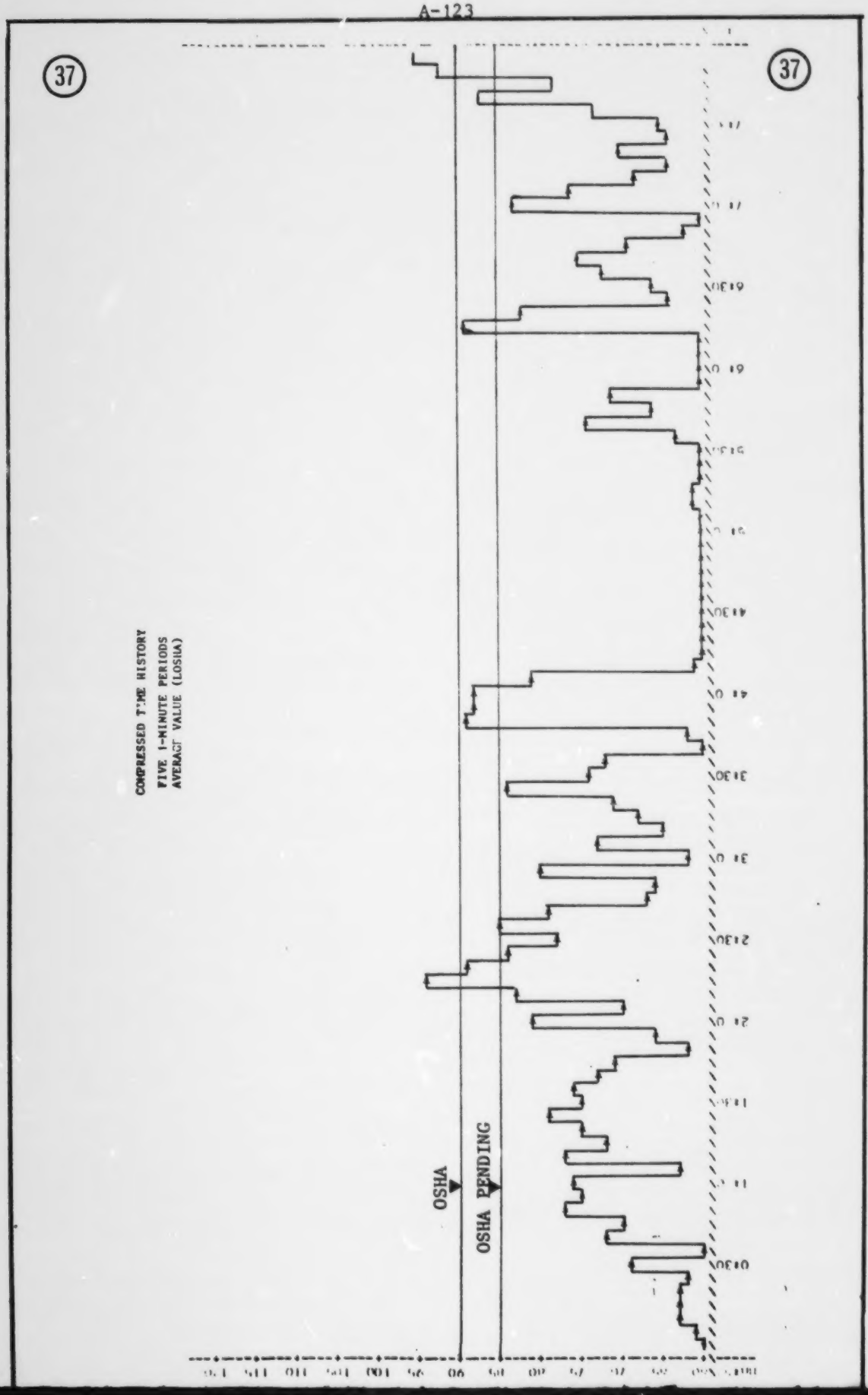
AMPLITUDE DISTRIBUTION

(37) (37)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
255	53.1	60 TO 64
52	10.4	65 TO 69
54	11.3	70 TO 74
39	8.1	75 TO 79
28	5.8	80 TO 84
29	6.0	85 TO 89
16	3.3	90 TO 94
7	1.5	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




37
37
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
03:30
14:30
21:30
31:30
41:30
61:30

(38)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(38)

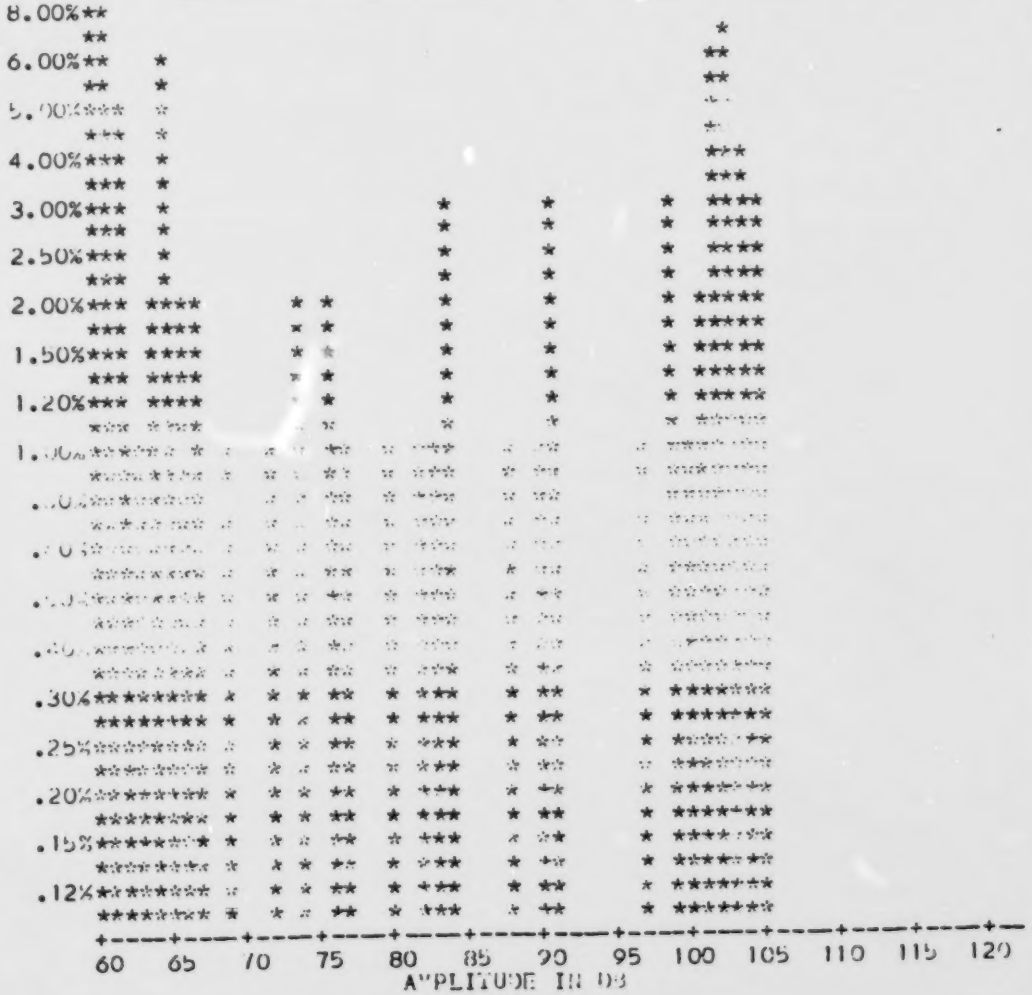
```
  1  26  80  1226   60   64    4    1
     90      30374  126
101  89  90  101  104  102  102  103  103   99   97  101  103  102  103  102
103  133 105 104  104  105  134  102  134  105  102   91   74   61   61
 67   72  69  69   62   76   65   61   65   61   60   64   66   60   64   62
 67   67  77  80   74   62   91   90   91   61   64   66    3    4   76   62
 60   61  60  60   60   61   60   60   60   60   60   60   60   60   60   60
 62   60  61  60   60   60   60   60   60   62   62    0    0   61    0
 60   60  60  60   63   60   60   61   69   66   60   60   60   61   60   60
 60   60  60  60   60   60   60   60   60   60   60   60   62   61   60   60
 61   60  60  60   60   60   60   60   60   60   60   60   60   60   60   60
 60
```

AMPLITUDE DISTRIBUTION

(38) (38)

FREQUENCY DISTRIBUTION		
FREQUENCY		RANGE
NUMBER	PER CENT	
425	88.5	60 TO 64
11	2.3	65 TO 69
3	.6	70 TO 74
3	.6	75 TO 79
6	1.3	80 TO 84
1	.2	85 TO 89
4	.8	90 TO 94
4	.8	95 TO 99
20	4.2	100 TO 104
3	.6	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

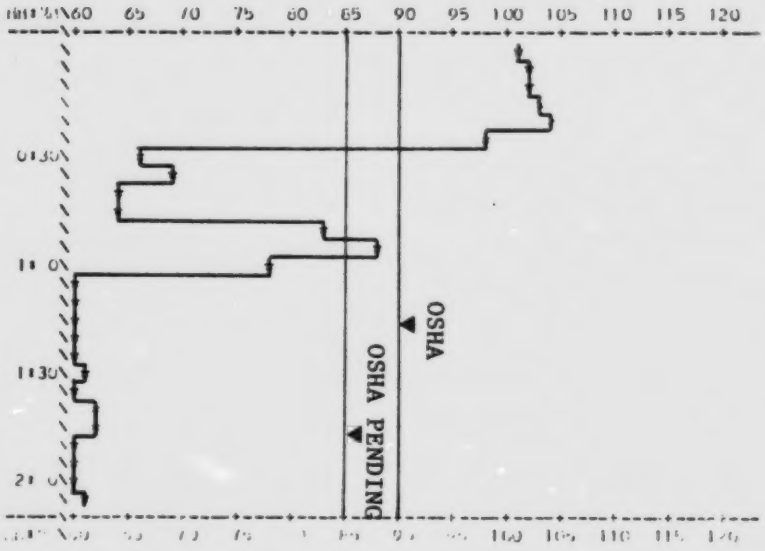


38

38

COMPRESSED TIME HISTORY
FIVE 1 MINUTE PERIODS

AVERAGE VALUE (LOSHA)



```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1216    60    64     4     1
    6998      115200   460
 70  60  67  60  71  68  60  71  70  67  67  72  67  67  68  63
 73  70  60  64  70  72  69  71  75  65  68  64  66  72  69  70
 74  71  66  71  65  69  62  71  71  76  91  92  91  87  95  93
 93  92  93  92  93  92  93  93  94  91  91  80  74  91  95  93
 68  67  60  61  63  60  65  73  74  65  74  74  66  66  71  73
 73  62  68  70  64  73  61  67  68  68  70  67  66  67  73  76
 71  75  72  73  72  76  69  75  68  69  72  71  66  69  72  71
 67  72  77  81  68  62  62  60  60  68  69  66  60  60  63  60
 66  64  63  60  65  61  67  77  63  65  65  64  66  67  67  63
 66  74  71  61  80  92  96  86  82  85  86  86  86  86  83  80
 86  87  85  95 102 102 102 102 102 103 101 101 103 103  96  96
 92  93  97  99  92  98  92 100 103 103 106  96  95  98  89  98
102 105 100 106 107 105 107 105 104 100 105 107  99  92  98  96
 99  98  99  99  99  99 102 102 103 101 102 102 103 102 101 101
104 102 103 104 103 103 104 104 103 101 106 105 102 102  99 100
100  96  95  96 101 100 101 100  99  97  91  91  94  93  92 104
105 104 104 103 103 104 101 104 104 103 103 100 101 101 100 100
100 100 101 102 100 102 100  99 103  99 100  97 101  99  99  97
 92  85  83  87  97  99  90  86  84  86  86  86  85  86  87  96
102 102 103 101  97  99 101 101 103 103 104  99  91  87  87  87
 88  86  90  99 100 100  98  87  84  95 106 106 105 103 100  97
103 105 104  91  85  91 104 101  99 104 105 105 105 102 103 101
101 105 104 104 104 105 104 101 101 101  99 100  97  97  98  98
 99 100  99  98  98  98  93  86  84  93  88  92 100 101  98  98
101 105 103 101 100  99 101 103 103 103 102 100  99  96  93  89
102 100  99  99 101 101 102 101 102 102 101 100  94  90  89  89
 85  82  81  81  82  83  87  99 102 104 102 103 106 107 107 105
107 104 106 105 107 106 106 106 106 100  97  99  91  84  96 103
102 103 104 104 105 104 102 102  98  88  89  86  89  87  87  90
 85  85  79  80  80  80  78  94  86  84  80  90  90  85  82  76
```

(39) (39)

```
ENTER LOT DATE (DD/MM/YR) : 11/07/79
ENTER SITE CODE (5 CHARS) : 30095
ENTER USER CODE (4 CHARS) : 0460
 ENTER JOB CODE (3 CHARS) : 047
```

```
   DATA LOGGED: 11 JULY 1979                DAT. ANALYZED : 12 SEPT 1979
      LOT NO  :  2-30123A                      SITE CODE :  30095
SERIAL [illegible] : 1210                      [illegible] : 047
[illegible] : 2                                [illegible] :
[illegible] : 48                               [illegible] :
SAMPLE [illegible] : 4760                      [illegible] = 115200
[illegible] = 98 : 1                           DAT[illegible] = 98304
```

```
                  TDS RECORD ANALYSIS

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[illegible]
[illegible]
  60 PER 0% COMPUTATIONS = 480
PERIOD = 1 MINUTES
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1	84.3	84.3	4.94
2	84.7	84.3	7.50
5	[illegible]	[illegible]	[illegible]
10	100.1	96.1	[illegible]
20	[illegible]	[illegible]	100.04
60	100.9	98.9	100.94
120	[illegible]	[illegible]	[illegible]
240	[illegible]	[illegible]	[illegible]

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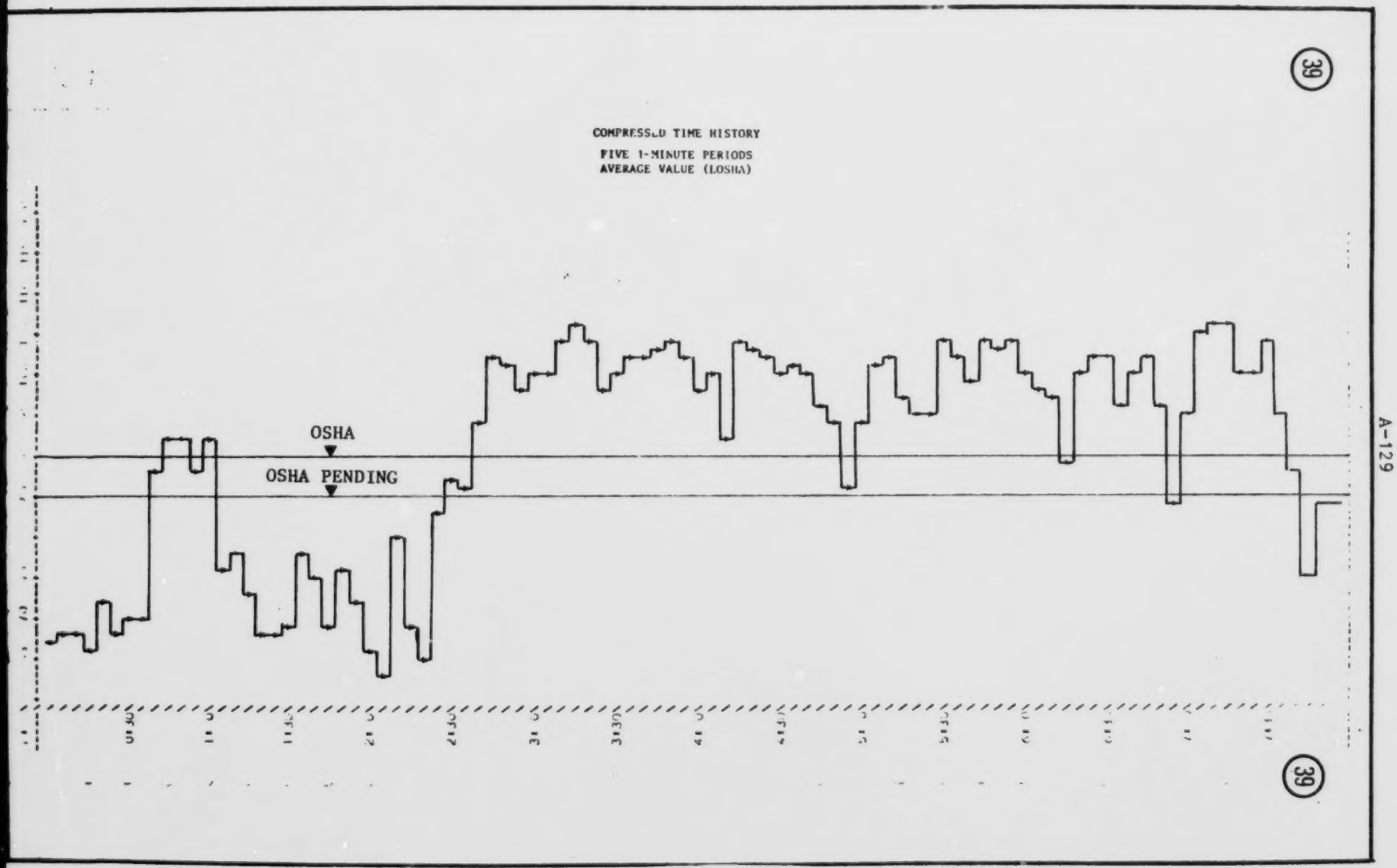
(39)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
36	7.5	60 TO 64
45	9.4	65 TO 69
33	6.9	70 TO 74
15	3.1	75 TO 79
22	4.6	80 TO 84
45	9.4	85 TO 89
41	8.5	90 TO 94
69	14.4	95 TO 99
139	29.0	100 TO 104
35	7.3	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


39
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
39

Energy, Mines and Resources Canada

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NOISE AND VIBRATION IN MINES RESEARCH REPORTS 1972-1986

edited by G. Knight *traduit par N.R Billette*

Volume 3C MRL 88–118C (R)

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NOISE AND VIBRATION IN MINES RESEARCH REPORTS: 1972-1986. VOLUME 3—MINE NOISE SURVEYS Part C

BRUIT ET VIBRATION DANS MINES RAPPORTS DE RECHERCHE RELEVÉS DE BRUITS DE MINES Partie C

Edited by G. KNIGHT

Canadian Mine Technology Laboratory

Traduit par N.R. Billette

Laboratoire canadien de technologie minière

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LABORATOIRES DE RECHERCHE MINIÈRE
RAPPORT DE DIVISION LRM 88–118C (R)

TABLE OF CONTENTS / TABLE DES MATIÈRES

Volume 1 Introduction and Measurement Methods
Introduction et techniques de mesure

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Glossary xiii
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Development of an anechoic chamber–72–142 13
2. Development of a standard method for testing noise exposure–73–108 35
3. A new graphical method for the evaluation of noise exposure–74–23 83
4. Noise monitor hat–74–88 119
5. Performance analysis on noise dosimeters and noise exposure monitors–75–6 139
6. Characteristics of the personal noise dose meter type 4425 as exemplified by serial no. 453311–75–23 183
7. Simple method of evaluation of the noise exposure index and the equivalent continuous sound level–75–71 207
8. Characteristics of GR–1944 noise dosimeter in the laboratory and in the field–76–83 225
9. Simple graphical method of evaluation of the noise exposure index and the equivalent continuous sound level–76–94 251
10. Tests of a noise exposure monitor helmet–77–94 267
11. A significant advance in noise monitoring instrumentation–78–62 295
12. Development of a noise monitor hat–79–40 327
13. Noise measurement in mines–80–47 365
14. Noise measurement at Denison Mines–81–54 391
15. New generation of noise dosimeters in Canadian mines–81–106 435
16. How CANMET tests noise pollution–83–56 451

Volume 2 Hearing Protection–Ear Muffs
Protection de l'ouïe–Protecteurs de supra-auriculaires

Foreword i
Avant-propos iii
Abstract v
Résumé vii

Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Effects of noise on man and hearing protection–72–140 13
2. Ear muff noise attenuation in Canadian mines–78–11 55
3. Efficiency of ear muffs in mines–78–72 227
4. Laboratory attenuation of ear muffs used in mines–78–73 287
5. Noise reduction evaluation of ear muffs–78–74 359
6. The acceptability of ear muffs–78–75 387
7. Attenuation of ear muffs in Canadian mines–78–100 427
8. Practical problems of hearing protector use in Canadian mines–80–59 493
9. Attenuation of ear muffs in mines from practice to practice
–iz prakse za prakso–82–128 523
10. Clamping force durability test–84–35 541
11. Attenuation measurement of ear muffs at Falconbridge complex:
No. 5 shaft, the East Mine and the mill and smelter, 1984–86–58 553
12. Attenuation measurements of ear muffs at Lockerby Mine, 1984–86–59 583
13. Attenuation measurements of ear muffs at Strathcona Mine, 1984–86–60 609
14. Attenuation measurements of ear muffs at Fraser Mine, 1984–86–61 643
15. Attenuation measurements of ear muffs at Falconbridge mines, 1984–86–88 671

Volume 3 Mine Noise Surveys—Part A / Relevés de bruits de mines—Partie A

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Noise measurements in Denison Mines–73–122 13
2. Preliminary noise survey at a mine-smelter complex–74–150 73
3. Noise measurement of trucks in Brunswick Mining and Smelting
No. 6 site–open pit–76–79 117
4. Noise measurements in No. 12 mine, Brunswick Mining and Smelting–77–36 ... 151
5. Noise measurements in Quirke No. 2 mine, Rio Algom–80–26 325
6. Noise measurement of auxiliary fans at Stanleigh Uranium Mine–82–78 373

Volume 3 Mine Noise Surveys—Part B / Relevés de bruits de mines—Partie B

Table of Contents / Table des matières i
7. Measurement of noise exposure index of underground service workers at
Denison Mines–82–142 401

8. Measurement of noise exposure index of operators on haulage equipment from the underground operations at Denison Mines–82–143 615
9. Noise measurement on underground crushing equipment at Denison Mines–82–144 747

Volume 3 Mine Noise Surveys—Part C / Relevés de bruit de mines—Partie C

Table of Contents / Table des matières i
10. Measurement of noise exposure index of miners at drilling operations at Denison Mines–82–145 883
11. Short noise measurements on fans at Fraser and Strathcona mines–83–114 1245
12. Measurement of impulse noise of vehicles at the Stanleigh Uranium mine–84–83 1261
13. Personal noise dosimetry survey of various occupational groups at four Potash mines in Saskatchewan–86–122 1295

Volume 4 Mill and Surface Plant Noise Surveys—Part A
Relevés de bruits d'usines et atelier de surface—Partie A

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Noise measurement in the concentrator at Brunswick Mining and Smelting–76–91 . 13
2. Noise measurement in the crushing and screening plant at Denison Mines–81–50 . 109
3. Noise measurement in grinding plant and coarse ore storage at Denison Mines–81–51 147
4. Noise measurement on surface maintenance locations at Denison Mines–81–52 .. 251

Volume 4 Mill and Surface Plant Noise Surveys—Part B
Relevés de bruits d'usines et ateliers de surface—Partie B

Table of Contents / Table des matières i
5. Noise measurement in assay laboratory at Denison Mines–81–53 487
6. Noise measurement in the hydrometallurgical plant at Denison Mines–81–95 571
7. Noise measurement at shafts No. 1 and No. 2 at Denison Mines–83–45 893
8. Problems and solution of environmental noise at Indusmin–84–54 915

Volume 5 Noise Abatement / Études de réduction du bruit

Foreword i
Avant-propos iii
Abstract v

Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
1. Production, characteristics and abatement of noise from light and medium rock drills–73–157 13
2. Noise attenuation in rock drills–75–39 71
3. Canada is one of the leading nations in noise abatement in mines–78–10 115
4. Diamond drill noise study: phase I–9–9023 139
5. Diamond drill noise study: phase II–0–9044 219
6. Abatement of noise and vibration in the Canadian mining industry–82–40 281
7. Cost effectiveness and technical feasibility of options available for sound-proofing diamond drilling equipment: phase III–1–9045 321
8. Noise attenuation with exhaust after treatment systems on a scooptram at Falconbridge's Strathcona mine–84–65 401
9. Practical work on the noise attenuation with exhaust after treatment systems on a ST4A scooptram–84–69 433

Volume 6 Vibration Studies and General / Études des vibrations et divers

Foreword i
Avant-propos iii
Abstract v
Résumé vii
Table of Contents / Table des matières ix
Introduction 1
Acknowledgements 6
Introduction en français 7
Vibration Studies / Études des vibrations
1. A study of vibration sources affecting mine workers–1–9133 13
General and Unclassified / Divers
2. Noise and vibration in Canadian mines–73–17 155
3. Introduction to noise measurement–73–40 363
4. Measurement and control of noise in Canadian mines: a review and progress report–74–76 397
5. An acoustical method for source location of methane–80–57 433
6. Combustion-noise and vibration research projects–82–66 445
7. Looking ten years backward and ten years forward at the battle against noise and vibration in Canadian mines–83–28 475
8. Heliport at Sudbury hospital–83–61 491

82-145 M.U. Savich

Measurement of noise exposure index of miners at drilling operations at Denison Mines Ltd. in Elliot Lake

1982

MESURE DE L'INDICE D'EXPOSITION AU BRUIT DES MINEURS DANS LES ACTIVITÉS DE FORATION DE LA DENISON MINES LTD. À ELLIOT LAKE

M.U. Savich*

RÉSUMÉ

La présente est une étude des problèmes, des méthodes et des interprétations concernant les mesures de l'indice d'exposition au bruit (IEB) effectuées avec des dosimètres de bruit de nouvelle génération. Les lectures sont données en valeurs de L_{OSHA} plutôt qu'en dose de bruit ou en IEB. L'analyse des mesures a révélé que les opérateurs de jumbos sont les plus exposés au bruit (L_{OSHA} = 103,8 dBA). Les poseurs de boulons dans le toit, les opérateurs de foreuses sur béquilles, les foreurs de long-trou et les stagiaires sur les fendues sont légèrement moins exposés (L_{OSHA} = 100 dBA). Pour les foreurs au diamant et les opérateurs de "girafe" et de "télédyne", le niveau L_{OSHA} est d'environ 97 dBA.

De nouveaux efforts visent présentement à apporter des éclaircissements sur des mesures permettant de rapprocher les résultats concernant ces travailleurs le plus près possible de ceux de la direction, afin d'assurer une plus grande sécurité et une plus grande productivité dans les mines.

Au total, 114 mesures ont été effectuées, dont huit ont été rejetées parce que les travailleurs ne portaient pas leur dosimètre adéquatement ou parce que le milieu minier était trop humide, présentait trop de vibrations ou contenait trop de poussières.

---

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MEASUREMENT OF NOISE EXPOSURE INDEX OF MINERS AT DRILLING OPERATIONS AT DENISON MINES LTD. IN ELLIOT LAKE

by

M.U. Savich*

ABSTRACT

The following is a discussion of problems, methods, and interpretations of Noise Exposure Index (NEI) measurements taken with a new generation of noise dosimeters. Measurement readings are represented in L_{OSHA} values instead of noise dose or NEI. Analysis of the measurements revealed that the jumbo operator is most exposed to noise (L_{OSHA} = 103.8 dBA). The roof bolter, jack leg miner, long hole driller and slope trainee are slightly less exposed ($L_{OSHA} \simeq$ 100 dBA). The diamond driller, giraffe and teledyne operator have an L_{OSHA} level of approximately 97 dBA.

A renewed effort is being made to bring more light into measurements to ensure that their results are as close as possible to management, for the sake of better security and higher productivity in mines.

In all, 114 measurements were taken, eight of which were rejected because either workers were not wearing their dosimeters properly, or the mining environment contained too much humidity, vibration and dust.

---

* Research Scientist, Elliot Lake Laboratory, CANMET, Energy, Mines and Resources Canada, Elliot Lake, Ontario.

CONTENTS

	Page
ABSTRACT	i
INTRODUCTION	1
JUMBO OPERATOR	1
ROOF BOLTER OPERATORS	6
JACKLEG MINER (DRILLER)	7
LONG HOLE DRILLER	8
DIAMOND DRILLER	9
GIRAFFE AND TELEDYNE OPERATORS	9
STOPE TRAINEES	10
SHIFT BOSS AND FOREMEN	10
MANAGEMENT REQUIREMENTS	11
CONCLUSIONS	11
REFERENCES	12
APPENDIX 1: Measurement of Noise Exposure Index on Drilling Operations with Full Information: LOSHA Current and Cumulative; Percent Dose (Current and Cumulative); Arithmetic Mean; Standard Deviation; Variance; Amplitude Distribution (Graphical and Numerical); and Time History (Graphical)	A-13
APPENDIX 2: Standard Job Procedure: Conventional Stope Drilling Operator	B-356

TABLE

No.		
1.	Results of LOSHA and time during work day	2

INTRODUCTION

While much attention has been focused on the measurement of noise in mining environments in terms of noise levels, relatively little has been done towards the profiling of noise exposure patterns during a shift using a computer program.

The value and limitations of measurements of noise exposure index from Appendices 1 to 114 are evident from Table 1. The table shows a general uniformity for the same operations over 8-hour periods, but also shows considerable differences between measurements taken from the same category of job. These measurements support the concept of different productivity of miners during a shift.

This report discusses the problems, methods and interpretations of Noise Exposure Index (NEI) measurements with a new generation of noise dosimeters. This discussion is very important for three reasons:

1. Relation between workers and dosimeters;
2. Relation between dosimeters and mining environment, such as humidity, vibration and dust;
3. Relation between noise and work in mines (productivity and time study).

JUMBO OPERATOR

Measurements on 21 jumbo operators were performed (Appendices 1 to 21). Two measurements were rejected as the readings in the 20-30 dBA range were too high due to humidity effects on the measuring instrument. For this reason dosimeters should be hermetically sealed in carrying cases as even a small leakage can be very damaging on results. From Table 1 it is evident that three levels of noise (LOSHA) exist:

1. 90-95 dBA has no major influence on the noise exposure index. Usually,

Table 1 - Results of LOSHA and time during work day

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
1	4388	281	Jumbo Operator	480	99.2	42	9	10	27	45	29	46	70	113	89	0	0	480	CC201
2	2809	080	Jumbo Operator	480	105.4	47	19	21	22	44	61	60	50	9	13	90	44	480	CC201
3	5146	281	Jumbo Operator	480	105.1	41	27	29	32	26	45	60	64	8	17	91	40	480	CC201
4	2901	281	Jumbo Operator	480	99.8	49	27	22	33	37	36	33	68	61	100	14	0	480	CC201
5	4074	281	Jumbo Operator	480	97.7	30	17	21	17	33	60	96	66	84	54	2	0	480	CC202
6	4473	272	Jumbo Operator	480	96.6	105	25	36	33	82	48	40	37	29	15	28	2	480	CC202
7	4090	281	Jumbo Operator	480	110.3	8	12	22	42	38	23	72	26	22	21	36	158	480	CC203
8	2901	281	Jumbo Operator	480	101.3	107	16	15	19	23	7	14	60	66	147	6	0	480	CC204
9	4174	270	Jumbo Operator	480	108.2	19	18	16	8	10	10	35	109	26	20	153	56	480	CC210
10	4290	271	Jumbo Operator	422	97.8	203	26	27	33	28	51	22	13	3	31	43	0	480	CC210
11	7086	281	Jumbo Operator	480	103.2	64	39	43	22	47	47	69	15	15	16	86	17	480	CC210
12	4227	270	Jumbo Operator	480	97.4	114	13	10	12	69	40	37	40	78	65	2	0	480	CC210
13	4296	281	Jumbo Operator	480	98.5	182	25	29	14	39	63	52	19	9	5	21	22	480	CC210
14	4296	281	Jumbo Operator	480	104.2	67	10	8	11	34	50	73	45	30	33	112	7	480	CC210
15	4227	270	Jumbo Operator	480	107.7	55	13	2	5	17	45	63	59	19	55	68	79	480	CC210
16*	7786	272	Jumbo Operator	480	111.7	48	12	6	3	3	25	49	131	24	11	11	157	480	28206
17	2371	281	Jumbo Operator	480	105.5	75	32	26	19	26	63	32	38	20	16	84	49	480	26055
18	7653	JDO	Jumbo Drill Op.	480	99.4	157	14	5	4	7	71	62	46	24	47	42	1	480	35950
19*	4673	170	Jumbo Operator	480	112.3	61	33	17	34	27	27	46	30	26	12	20	147	480	35950
20	4296	C80	Jumbo Operator	480	93.7	56	38	30	21	49	142	68	39	11	6	20	0	480	42954
21	4227	C80	Jumbo Operator	480	76.3	318	59	44	23	6	4	10	16	0	0	0	0	480	42954
			Mean	476.95	103.78	91.53	23.11	21.89	20.89	34.74	47.11	49.68	46.32	33	39.47	47.26	25	480	
			Std. Dev.	13.3	Log Aver.	76.8	12.47	11.98	10.55	19.5	30.18	22.52	24.09	31.72	38.33	44.56	40.3	480	
22	4597	272	Roof Bolter	480	103.2	55	13	13	12	13	24	40	67	63	116	64	0	480	CC201
23	0335	271	Roof Bolter	480	101.5	17	18	49	11	142	21	55	37	17	19	94	0	480	CC201
24*	7635	271	Roof Bolter	170	96	369	13	11	8	7	13	20	15	4	16	4	0	480	CC202
25	4123	271	Rock Bolter	480	96.1	75	18	31	52	52	60	43	35	54	60	0	0	480	CC202
26	7913	281	Rock Bolter	480	99.1	38	10	19	13	17	31	66	91	135	60	0	0	480	CC202
27	4155	010	Rock Bolter	480	99.1	86	24	18	20	70	69	57	43	17	25	50	1	480	CC204
28	1108	281	Rock Bolter	480	106.2	24	14	21	13	13	45	45	43	36	67	152	7	480	28205
29	4194	271	Rock Bolter	480	86.8	216	42	30	19	27	41	47	40	18	0	0	0	480	CC205
30	4350	272	Rock Bolter	480	84.9	264	23	17	17	18	55	40	39	7	0	0	0	480	CC205

* Not estimated

Cont. overleaf

Table 1 - Cont.

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
31	4089	281	Roof Bolter	480	85.2	138	48	46	31	51	86	48	29	3	0	0	0	480	CC210
32	4155	010	Roof Bolter	480	92.9	57	18	29	44	87	87	39	45	64	10	0	0	480	CC210
33	4089	281	Roof Bolter	480	96.2	60	32	40	31	17	33	86	74	53	54	0	0	480	CC210
34	4695	214	Roof Bolter	480	100	90	14	15	16	12	79	90	37	28	50	49	0	480	CC210
35	7610	281	Roof Bolter	480	94.2	81	28	27	19	34	40	74	92	72	13	0	0	480	CC210
36	4195	271	Roof Bolter	480	90.4	207	40	27	20	43	37	36	35	13	21	1	0	480	20960
37	4350	272	Roof Bolter	462	90.5	250	29	21	26	39	23	23	33	11	22	3	0	480	20960
38*	0335	271	Roof Bolter	480	112.8	50	32	12	8	19	10	28	16	3	1	36	265	480	20960
39	2814	281	Roof Bolter	480	93.9	187	35	33	33	22	34	50	33	16	21	16	0	480	22304
40	4719	296	Roof Bolter	480	95.7	131	39	20	22	16	34	72	67	44	21	14	0	480	26210
41	7610	210	Roof Bolter	468	102.5	73	19	22	11	8	12	80	75	30	84	66	0	480	42072
42	4631	271	Roof Bolter	480	103.1	43	12	11	7	4	4	84	121	61	59	73	1	480	45961
			Mean	478.42	99.35	110.11	25.05	25.74	21.95	36.05	42.89	56.58	54.53	39.05	36.95	30.63	0.47	480	
			Std. Dev.	4.81	Log Aver. 78.02		11.5	10.63	11.78	33.91	24.01	19.51	25.85	31.94	31.82	42.98	1.61	480	
43	4566	272	Jackleg Miner	480	108.8	156	87	59	28	24	38	39	27	15	1	5	1	480	CC210
44	4566	272	Jackleg Miner	480	88.6	92	59	40	33	100	52	34	43	23	4	0	0	480	CC210
45	4379	281	Jackleg Miner	480	84.8	229	31	30	23	33	30	60	42	2	0	0	0	480	CC201
46	4624	DAM	Driller "A" Miner	480	89.2	131	60	77	76	38	19	21	18	24	12	4	0	480	98013
47	4624	DRA	Driller "A" Miner	480	96.2	179	63	53	33	32	13	13	17	14	28	35	0	480	98013
48	4769	DRL	Driller	480	82.3	259	89	44	15	4	17	16	26	9	1	0	0	480	32950
49	4766	DRI	Driller	480	97.3	131	47	37	21	44	17	38	20	[illegible]	93	3	0	480	32950
50	7745	DGM	Driller Gen Miner	480	99.2	101	26	19	12	26	19	19	106	45	103	4	0	480	32950
51	4486	DGM	Driller Gen Miner	480	98.8	169	5	3	3	21	59	55	53	31	53	22	6	480	35950
52	4637	DGM	Driller Gen Miner	480	109.1	145	32	16	16	30	19	30	16	11	19	36	110	480	98004
53*	4410	DGM	Driller Gen Miner	336	77.4	298	66	32	32	10	31	7	3	1	0	0	0	480	98034
54	4637	DGM	Driller Gen Miner	480	106.9	164	35	27	20	19	27	43	11	13	16	33	72	480	98044
55	4636	DGM	Driller Gen Miner	480	104	160	39	44	27	29	28	31	28	12	19	27	36	480	29003
56	2525	270	Miner	480	81.1	242	58	36	29	40	20	38	16	1	0	0	0	480	20960
57	4770	272	Miner	480	94.4	234	41	39	17	28	11	19	12	26	38	15	0	480	29003
58	4636	272	Miner	480	92.7	177	53	55	44	35	24	19	19	[illegible]	20	13	0	480	29003
59	4549	272	General Miner	480	98.2	146	55	42	33	38	12	25	44	33	10	36	6	480	29003
60	4693	272	General Miner	480	92.9	256	36	32	20	36	13	14	15	15	33	10	0	480	32016

* Not estimated

Cont. overleaf

Table 1 - Cont.

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
61	4766	272	Miner	480	102.5	107	31	34	20	27	28	37	23	16	74	81	2	480	32950
62	7289	270	"A" Miner	480	97.3	135	44	37	44	30	30	43	52	22	12	20	11	480	35950
63	4768	272	Miner	480	100.1	51	33	34	12	17	35	32	100	47	102	17	0	480	35950
64	4608	272	General Miner	480	80.5	237	41	21	36	76	36	17	16	0	0	0	0	480	98013
65	4769	272	Miner	480	79.6	152	52	68	80	67	38	12	11	0	0	0	0	480	98013
66	4686	272	Miner	480	97.7	204	52	51	40	48	24	15	7	4	7	10	18	480	98013
67	4761	272	General Miner	480	77.4	288	19	24	23	93	15	14	4	0	0	0	0	480	98013
68	4687	271	Miner	480	92.6	100	40	20	17	24	142	61	37	12	20	7	0	480	42953
69	5543	270	Miner	480	104.8	83	21	17	29	86	68	9	15	21	21	63	47	480	LEAPO
70	8397	271	Miner	480	98.7	30	9	24	32	151	83	36	34	13	20	45	3	480	LEAPO
71	4793	270	Miner	480	81.7	209	44	52	33	30	42	61	8	1	0	0	0	480	1SHAF
72	4714	274	Miner	480	93.7	16	6	17	15	240	74	44	32	7	14	12	3	480	2CARA
73	4624	272	Miner	480	89	88	51	93	70	51	33	13	18	63	0	0	0	480	SHAFI
74	4640	273	Miner Helper	480	97.5	120	17	9	10	15	26	28	108	100	44	3	0	480	29950
75	4688	274	Miner Helper	480	76.2	263	69	45	34	25	24	15	5	0	0	0	0	480	30950
76	4694	MH1	Miner Helper	480	99	81	30	25	26	37	52	52	42	18	105	12	0	480	32950
77*	4701	273	Miner Helper	325	94.8	317	15	10	4	15	35	18	21	14	18	13	0	480	32950
78	4694	MIH	Miner Helper	480	89.5	97	63	35	38	88	72	34	15	24	14	0	0	480	32950
79	4721	274	Miner Helper	480	84.3	248	49	37	25	22	26	37	25	9	2	0	0	480	33950
80*	7845	MIH	Miner Helper	211	78.1	401	32	12	7	6	8	9	4	1	0	0	0	480	98034
81	4692	273	Miner Helper	480	69.8	439	13	4	6	9	6	1	0	1	1	0	0	480	00000
82	4734	273	Miner Helper	480	80.1	246	34	61	40	34	39	23	2	0	0	0	1	480	SCHST
83	4186	270	Operator	477	89.9	97	38	42	82	66	25	21	72	37	0	0	0	480	CC201
84	4449	271	Operator	480	93	154	37	13	12	13	40	69	65	72	5	0	0	480	CC201
85	7721	270	Hydro Air Truck	480	96.3	117	34	23	19	47	24	59	39	61	53	4	0	480	1SHAF
86	2855	270	Hydro Air Truck	480	82.9	174	49	36	26	134	15	20	17	9	0	0	0	480	CC204
			Mean	479.9	99.63	163.59	41.27	35.98	29.73	48.95	34.51	30.9	30.73	21	23.02	12.61	7.71	480	
			Std. Dev.	0.4	Log aver.	80.97	19.15	19.06	18.71	44.38	25.15	16.87	26.83	21.96	31.14	18.62	21.73	480	
87	7720	281	Longhole Driller	480	99.3	52	17	9	17	14	13	74	84	140	54	6	0	480	32950
			Mean	480	99.3	52	17	9	17	14	13	74	84	140	54	6	-	480	
			Std. Dev.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	480	

* Not estimated

Cont. overleaf

Table 1 - Cont.

No.	User Code	Job Code	Operation	Time (min)	L_{OSHA} (dBA)	Frequency Distribution (min/dBA)												Σ Time (min)	Note
						60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119		
88	7870	260	Diamond Driller	480	96.7	82	46	24	18	36	59	88	47	31	25	22	2	480	CC202
89	4126	261	Diamond Driller	480	99.9	85	32	38	21	31	56	81	52	22	21	17	24	480	CC202
90	0850	261	Diamond Driller	480	97.7	62	28	28	10	22	159	56	35	21	32	24	3	480	CC210
91	0850	261	Diamond Driller	480	91.7	93	50	36	22	23	114	72	37	14	12	7	0	480	CC231
			Mean	480	97.37 ▲	80.5	39	31.5	17.75	28	97	74.25	42.75	22	22.5	17.5	7.25	480	
			Std. Dev.	-	Log aver	13.18	10.65	6.61	5.44	6.68	49.19	13.82	8.1	6.98	8.35	7.59	11.24	480	
92*	7960	010	Giraffe Operator	246	85.2	361	25	11	9	6	12	34	17	5	0	0	0	480	20065
93	4483	272	Giraffe Operator	480	93.8	91	11	7	10	38	48	83	142	45	5	0	0	480	20065
94	4753	213	R.B.L. Truck Op.	480	92.6	130	36	29	39	38	47	41	31	81	8	0	0	480	00307
95	4362	TEL	Teledyne Op.	480	93.1	57	24	25	28	34	50	118	124	13	1	6	0	480	00307
96	4560	273	Teledyne Op.	480	98.2	139	20	6	15	24	33	51	43	57	85	7	0	480	00210
97	7762	271	Teledyne Op.	480	101.5	34	12	12	6	9	57	93	61	113	43	34	6	480	00210
			Mean	480	97.32 ▲	90.2	20.6	15.8	19.6	28.6	47	77.2	80.2	61.8	28.4	9.4	1.2	480	
			Std. Dev.	-	Log aver	45.35	10.19	10.57	13.65	12.36	8.75	31.4	49.78	37.67	35.82	14.14	2.68	480	
98	1880	281	Stope Instructor	480	102.3	52	24	26	22	4	61	79	93	25	16	62	16	480	45050
99	4735	296	Stope Trainee	480	100	77	19	20	48	33	62	54	26	39	57	45	0	480	SCHST
100	4763	296	Stope Trainee	480	100.1	79	28	64	52	64	23	20	24	44	30	44	8	480	SCHST
101	4718	296	Stope Trainee	480	102.8	50	36	49	39	62	28	36	35	52	35	26	32	480	SCHST
102	4719	296	Stope Trainee	480	92.4	32	32	28	16	8	124	114	88	37	1	0	0	480	SCHST
103	4729	296	Stope Trainee	480	96.2	137	56	39	37	39	17	18	41	39	38	19	0	480	SCHST
			Mean	480	100.15 ▲	71.17	32.5	37.67	35.67	35	52.50	53.5	51.17	39.33	29.5	32.67	9.33	480	
			Std. Dev.	-	Log aver	36.82	12.96	16.52	14.18	25.61	40.01	37.42	31.12	8.87	19.25	22.09	12.82	480.01	
104	9612	SHI	Shift Boss	480	88.4	196	49	32	31	53	27	34	26	22	9	1	0	480	CC201
105	9608	SHB	Shift Boss	480	86.4	240	28	34	18	16	39	65	30	6	3	1	0	480	CC203
106	9575	SHB	Shift Boss	480	87.5	46	49	70	57	45	49	121	42	0	1	0	0	480	CC205
107	9636	SHB	Shift Boss	480	88.8	153	90	58	29	24	38	37	29	15	1	5	1	480	CC210
108	9630	SHB	Shift Boss	480	87.2	241	49	17	23	19	31	41	36	20	3	0	0	480	CC210
109	9508	SHB	Shift Boss	478	81.5	196	72	61	39	34	22	38	17	1	0	0	0	480	00307
110	9574	SHB	Shift Boss	480	77.5	312	45	41	26	15	18	8	14	1	0	0	0	480	00308
111	9590	SHI	Shift Boss	480	79.5	189	50	69	46	59	34	28	4	1	0	0	0	480	00000
112	9638	SHF	Shifter	480	86.3	86	30	34	30	25	174	84	16	1	0	0	0	480	2SHAF
			Mean	479.76	86.12 ▲	184.33	51.33	46.22	33.22	32.22	48	50.67	23.78	7.44	1.89	0.78	0.11	480	
			Std. Dev.	0.67	Log aver	81.16	19.3	18.79	12.16	16.47	48.17	34.12	11.97	9.02	2.93	1.64	0.33	479.99	
113	9637	FOR	Foreman	480	88.5	197	31	18	16	44	32	52	73	17	0	0	0	480	20511
114	9614	FOR	Foreman	480	85	210	58	31	31	29	42	42	27	8	2	0	0	480	00448
			Mean	480	87.09 ▲	203.5	44.5	24.5	23.5	36.5	37	47	50	12.5	1	-	-	480	
			Std. Dev.	-	Log aver	9.19	19.09	9.19	10.61	10.61	7.07	7.07	32.53	6.36	1.41	-	-	480	

* Not estimated

this noise was created during the set-up time and while moving the rig.

2. 95-105 dBA has a major influence on the noise exposure index. This noise corresponds to the drilling time.
3. >105 dBA, over the OSHA permissible level, has also great influence on noise exposure index because this level has 25 minute duration time. The OSHA places more emphasis upon the peak noises, while different laws based upon 5 decibels exchange rate between sound pressure level and duration are used to obtain the equivalent exposure.

The average time of useful work was 4 hours, 50 minutes set-up and drive time of the rig, and 3 hours and 10 minutes drilling time. In other Canadian mines, the average time of useful work is 3 hours and 51 minutes. Although the Canadian average for useful work is realized at Denison Mine, new effort should be made to increase productivity. At the same time it is necessary to demand the mandatory use of ear plugs and ear muffs due to high noise levels, also at the same time making it mandatory to use plugs and ear muffs because noise is too high. From the statistical point of view in nine cases jumbo operators had continual work in the morning and afternoon, in seven cases jumbo operators drilled only in the morning, and in the afternoon he moved the jumbo. In one case he drilled for only a short time before and after lunch. It is quite evident that all organization on the jumbo drilling machine needs improvement.

ROOF BOLTER OPERATORS

Twenty-one tests were performed on the roof bolter operators (Table 1 and Appendices 1, 22 to 42). Tests showed very good organization of work, high discipline and a high level of responsibility. In one instance only a test was spoiled by the operator removing the dosimeter (Appendix 38). One

more measurement was lost because the worker left the job during the shift. The useful drilling work was three hours and thirty-eight minutes. However, useful work should include:

1. Wash, scale and muck out round.
2. Sound the back and re-check scaling. Complete cleaning of boot legs and check for missing holes.
3. Install rockbolts on a 1.3 x 1.3 m pattern: bolts must be installed after hole is drilled. Additional rock bolts and/or straps may be required as ground conditions warrant, etc.

All work can be followed from time history graphs. Tests show the following:

- noise exposure index is not too high because roof bolting is complex work, where drilling is only one part of the useful work (see Table 1 and Appendix 1, 22 to 42);
- drilling is not continuous work. Shorter or longer breaks are often seen; and
- only ear muffs with a strap are used in this category of job because very often head movement causes hat discomfort. In this case the efficiency of ear muffs is very low. It should be mandatory for ear plugs and ear muffs to be used with the strap.

Analyses of NEI from Canadian mines shows constant problems and opinions. This consistency points to a basic uniformity of the work.

JACKLEG MINER (DRILLER)

Forty-four measurements were performed on the NEI (Appendix 1, 43 to 86). Three measurements were rejected because of partial shift measurements. In the test LOSHA is very variable, from 69.8 dBA to 109.1 dBA, and at the

same time the NEI is variable. The noise times higher than 90 dBA were entered into the computer and the average result is 2 hours and 6 minutes. Similar measurements at Denison Mine were performed on February 14th, 1973 (1). The total time over 90 dBA level was 1 hour and 56 minutes. Both of them are very close. Noise Branch, Division of Health Technology, Pittsburgh, Technical Support Center, Mine Safety and Health Administration, U.S. Department of Labor did 64,000 measurements, and the operating time per shift was 2 hours (2). This is an irrefutable argument that profiling dosimeters are doing well.

Denison Mine has the following job classifications for miners:

Code	Classification
270	"A" Miner
271	General Miner - Grade 1
272	General Miner - Grade 2
273	Miner Helper - Grade 1
274	Miner Helper - Grade 2

Tests with noise dosimeters show poor agreement between job classifications and job procedures. Conventional mining steps are underlined in their proper order. All steps and key points must be followed to achieve maximum efficiency and avoid downgrading incidents (Table 2). Tests from Appendices 43 to 86 should be very instructive for establishing a good standard of job procedures (Example in Appendix 2).

LONG HOLE DRILLER

Only one measurement was taken (Appendix 87). L_{OSHA} was 99.3 dBA. A similar test was performed on 12th February, 1973 with the sound level meter and stopwatch. Both of them have equal time of noise over 90 dBA, but different NEI.

Measurement	12/02/1973	25/09/1979
Time (h) (>90 dBA)	5.9555	5.9666
N.E.I.	18.43	3.64

Large numbers of tests will produce the true results and show the reason for the large difference in these readings.

DIAMOND DRILLER

From four measurements of NEI on diamond drillers it may be seen that three tests (Appendix 1, 88 to 90) are very close and show a range of values of L_{OSHA} = 96.7 to 99.9 dBA. The fourth test shows a lower value, probably resulting from a deeper drill hole.

The noise level from drilling decreases rapidly as the depth of the drill hole increases, and drilling noise becomes uniform because there is not much retracting and inserting of rods. From time history diagrams a distinct work period cannot be identified by the type of work done such as, remove core, place core, place diamond bit, insert rods, etc. This may be expected as these work periods are of less than 1 minute duration. This is an instance where with current technology the profiling dosimeter cannot be used to produce standard job procedures or time studies. The useful work period measured was 3.1 hours which is a good average for diamond drilling equipment.

GIRAFFE AND TELEDYNE OPERATORS

Six measurements were completed (Appendices 92 to 97). Test No. 92 was rejected as it was stopped after only 4 hours. The results show great differences in value as the standard deviation is high. From the time history graphs it is seen that the work is intensive and dependent on the existing

requirements. Useful work time was very high, 4.3 hours, with noise in excess of 90 dBA.

STOPE TRAINEES

This was a short but very interesting test for two reasons:

1. The results show a great similarity to roof bolters and jackleg miners;
2. They confirm the similarity of the trainees at Denison Mine.

The time history chart displays the effort of each participant through generated noise. Each tries with more or less effort to drill continuously (Appendix 1, 99 to 103). The stope instructor shows good effort to be with the trainees (see time history Appendix 98). The L_{OSHA} was slightly higher than measured for similar work categories and the useful work time was long.

Operation	L_{OSHA} (dBA)	Time (h) >90 dBA
Roof bolter operators	99.35	3.64
Jackleg miner	99.63	2.10
Stope trainee	100.15	3.59

The NEI for stope trainees was similar to roof bolter operators. This is an instance where an instructor and his students may be controlled. Further results produced are accurate and independent of subjective thought.

SHIFT BOSS AND FOREMEN

Supervision of the work force has always been required for the following reasons:

- immediate direction of work efforts
- control of safety in the work place
- leadership
- assuming of responsibility.

In each case it is expected that the shift boss or foremen be with the workers. The single tour of the work place is insufficient as this becomes a routine courtesy call. The tests show that on the basis of time spent in the noisiest locations, shift bosses spend 1.4 hours and foremen 1.84 hours respectively with the workers during work hours (Table 1). In each case the actual time spent in the work place is longer as the worker stops working to receive advice and direction. It is interesting to note that foremen spend almost 30 minutes more with the workers than do the shift bosses.

The L_{OSHA} was low in both cases, 86 to 87 dBA. Shift bosses and foremen are not exposed to excessive noise and in each case the NEI was below one (Appendix 1, 104 to 114).

MANAGEMENT REQUIREMENTS

In every case management would not be satisfied to have the job categories, such as operators of drilling equipment, supervisory personnel, etc., shown by time history graphs as in this report. Five minute averaging is often too long and does not permit the identification of many routine work occurrences. Because of this, Elliot Lake Laboratories, in cooperation with instrument manufacturers, has made it possible for the time history diagram to be produced on demand on a 1 to 5 minute interval. Less than 1 minute cannot be achieved as this is the limit of the profiling dosimeter. To achieve an interval of 0.5 or 0.25 minutes additional equipment added to the instrument would make it unsuited for wearing in the work place (with present technology).

CONCLUSIONS

Drilling equipment is regarded as the most dangerous noise source affecting workers hearing. The problems, methods and analysis of NEI measurements

with a new generation of noise dosimeters has been discussed. Analysis of the results has shown that jumbo operators are exposed to the greatest noise L_{OSHA} = 103.8 dBA. Roof bolters, jackleg miners, long hole drillers and stope trainees are exposed to noise $L_{OSHA} \simeq$ 100 dBA. Diamond drillers, giraffe and teledyne operators are exposed to somewhat less noise $L_{OSHA} \simeq$ 97 dBA. Shift bosses and foremen are below the dangerous level and noise is L_{OSHA} = 88 dBA.

The results are in agreement with previous measurements in other locations and with laboratory results.

A new effort has been made to bring more definition to the measurements and deliver more information to management on the improvement of safety and productivity in mines.

REFERENCES

1. Savich, M., "Noise measurements in Denison Mines"; Division Report 73-122; CANMET, Energy, Mines and Resources Canada; 1973.

2. Giardino, D.A. and Marraccini, L.C., "Noise in the mining industry - an overview"; Proc NOISE-CON 79, Machinery Noise Control, Purdue University, West Lafayette, Indiana, 30th April to 2nd May, 1979.

APPENDIX 1

MEASUREMENT OF NOISE EXPOSURE INDEX ON DRILLING OPERATIONS WITH FULL INFORMATION: L_{OSHA} CURRENT AND CUMULATIVE; PERCENT DOSE (CURRENT AND CUMULATIVE); ARITHMETIC MEAN; STANDARD DEVIATION; VARIANCE; AMPLITUDE DISTRIBUTION (GRAPHICAL AND NUMERICAL); AND TIME HISTORY (GRAPHICAL).

(1)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(1)

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 87  74  76  75  62  60  60  60  63  92  90 102 101  96 103 103
104 101 103 106 104 102 105 104 105 103 106 105 105 102 106 102
101 102 102 101 101 101 101 104 103 101  92 105 104 106 102 106 106
105 102 1 2 1 5 104 103 105 107 105 104 103 103 103 93  94  94
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100 101  98 102 100 101 100 102  97  98 101  94  99  97  81  81
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 87  85  86  87 100  97  97 101  96  92  96  84  86  86  96  85
 81  61  60  60  60  60  82  94  94 102 104 103 102 104 105 104
105 105 103 105 104 105 104 104 105 104 105 103 107 104 106  98
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103 102 106 106 104 101 102 105 105 104 107 105 102 103 106 105
105 105 108 105 107 105 106 105 105 107 105 104 105 106 104  97
103 106 106 105 105 106 106 107 105 101 106 107 106 104 101 104
107 106 104 106 106 105 106 106 104 105 106 106 105 108 106 101
108 106 105 104 108 106 103 105 107 105 100 108 106 104 104 103
 96 102 105 101 100 101 100  94  88  82  92  98  97  98  99  92
100  89  90  89  98 100  97 102 103 101  83  65  61  60  64  60
 63  63  61  61  68  64  62  66  60  60  60  61  60  60  60  61
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ENTER USER CODE (4 CHARS) : 43##
ENTER JOB CODE (3 CHARS) : 281

DATA LOGGED : 18 JULY 1979
LOGGER : [illegible]-301/26
SERIAL NUMBER : 1212
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible] 0

DATA ANALYZED : 14 SEPT 1979
SITE CODE : CC201
JOB CODE : 281
USER CODE : 43##
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STARTING TIME = [illegible] 0454

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOG BASE = 10 / 8 LOG
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

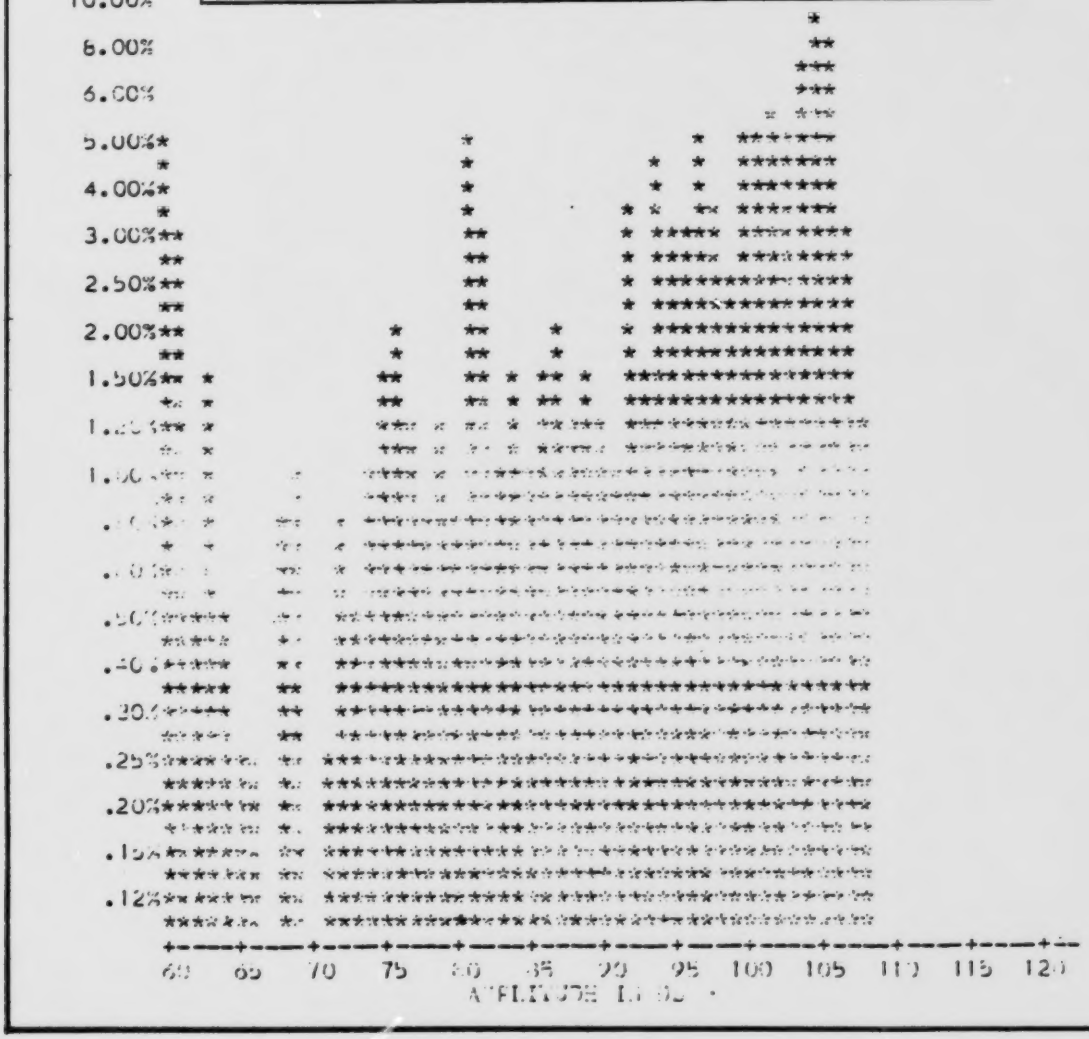
TIME HOUR	LOG-A CURRENT	LOG-A CUMULATIVE	LOG-E CURRENT	LOG-E CUMULATIVE
1	91.4	91.4	15.105	15.11
2	102.4	98.8	69.335	84.64
3	93.7	97.5	20.019	104.66
4	93.0	96.6	16.970	121.63
5	95.6	96.4	27.219	151.65
6	104.1	98.4	88.481	240.13
7	105.1	99.8	101.869	341.00
8	91.4	99.2	15.969	356.96

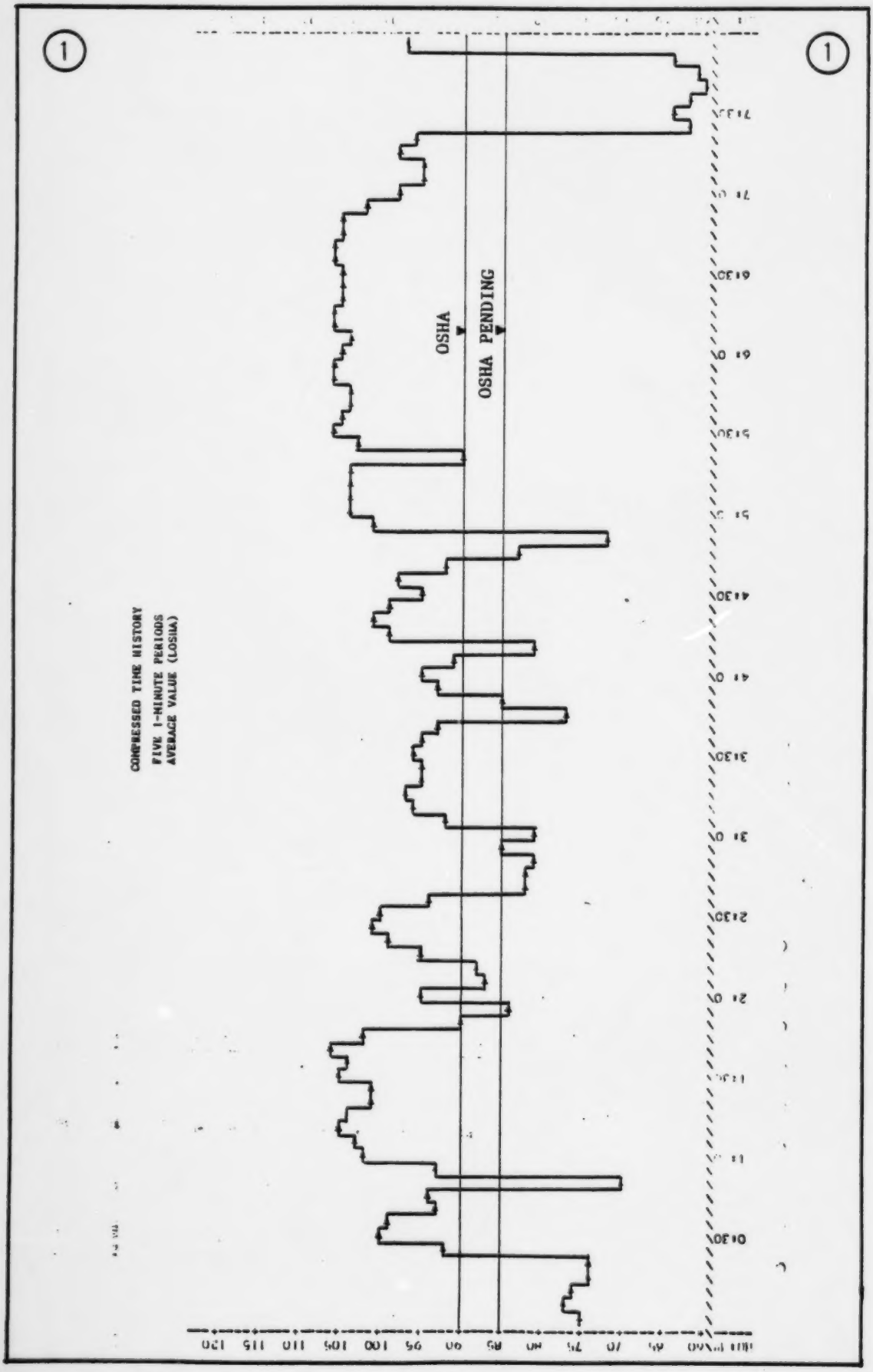
MIN. COMP. = 60 DB
MAX. COMP. = 108 DB
ARITHMETIC MEAN = 92 DB
STD. DEVIA. [illegible] = 14 DB
VARIANCE =196 DB

AMPLITUDE DISTRIBUTION

(1)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
42	8.8	60 TO 64
9	1.9	65 TO 69
10	2.1	70 TO 74
27	5.6	75 TO 79
45	9.4	80 TO 84
29	6.0	85 TO 89
46	9.6	90 TO 94
70	14.6	95 TO 99
113	23.5	100 TO 104
89	18.5	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




1
1
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
120
115
110
105
100
95
90
85
80
75
70
65
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1:00
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(2)

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PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
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     447    115200  480
 70  73  69  71  79  68  65  69  70  72  78  74  80  87  95  95
 95  97  97  97  96  96  96  96  91  96  95  95  96  95  95  97
 97  91  91  94  90  82  71  60  60  60  60  60  60  60  60  60
 60  66  [illegible]  93  90  80  80  79  73  69  70  64  66  70  67  63
 90  97  [illegible]  90  84  84  85  86  86  [illegible]  105  111  112  115  113  113
114 113 114 114 114 114 114 114 114 115 115 116 114 114 113 114
112 111 112 114 114 114 114 113 113 114 114 114 112 112 112 114
114 114 114 113 112 113 112 100  99  99 100 101 101 106 112 112
112 112 112  96  97 115 115 115 [illegible] 115 115 115 114 [illegible] [illegible] [illegible]
114 115 116 116 116 116 116 116 115 116 115 113 113 114 114 114
113 113 113 115 115 115 115 116 116 116 107 110 113 111  97  91
 86  86  [illegible]  87  91  89  [illegible]  [illegible] 108 115 114 115 115 [illegible] [illegible] [illegible]
115 114 115 116 115 115 115 115 115 114 113 113 113 111 113 112
111 109 108  94 104  90 107 112 112 107 105 105 104 112 112 112
112 112 112 112 110 110 112 112 112 112 109 103 106 112 112 112
112 112 108 103 111  94  87  90  90  90  89  89  89  88  66  60
 60  60  60  60  60  60  60  60  60  60  56  60  60  60  60  61
 60  60  69  60  60  60  60  60  60  60  60  60  60  60  77  83
 70  88  [illegible]  90  90  89  95  96  95  95  95  93  93  94  95  95
 94  88  93  95  94  94  93  89  94  94  94  93  89  95  95  95
 94  92  89  87  87  87  88  71  67  70  83  84  84  83  78  78
 84  85  84  84  75  81  73  67  67  76  70  71  61  78  82  81
 81  80  81  80  76  69  67  73  81  83  82  83  83  80  83  81
 83  86  85  84  76  74  84  86  85  85  87  82  88  90  88  90
 91  86  86  90  91  90  86  86  84  87  87  84  86  89  88  90
 83  89  92  96  97  93  86  94  97  88  82  85  79  85  92  96
 95  97  94  96  99  88  87  89  84  82  86  88 100  93  97  96
 88  82  60  60  64  69  64  63  59  76  81  84  79  76  74  73
 78  76  91  88  89  97  89  91  88  92  91  87  98  94  96  93
 93  94  95  93  92  91  91  90  93  91  78  73  78  79  79  77
>EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 18/07/79
ENTER SITE CODE (5 CHARS) : CC201
ENTER USER CODE (4 CHARS) : 2809
 ENTER JOB CODE (3 CHARS) : 080
```

```
    DATA LOGGED :18 JULY 1979          DATA ANALYZED : 14 SEPT 1979
         LOGGER : 00-301/26                 SITE CODE : CC201
SERIAL NUMBER : 1216                        JOB CODE : 080
     BASELINE : 60 DB                       USER CODE : 2809
DYNAMIC RANGE : 54 DB                      THRESHOLD : 80 DB
SAMPLING RATE : 4/SEC                  TOTAL SAMPLES =  115200
TEST DURATION =  [illegible]  STANDARD TIME =  [illegible]
```

TIME HISTORY ANALYSIS

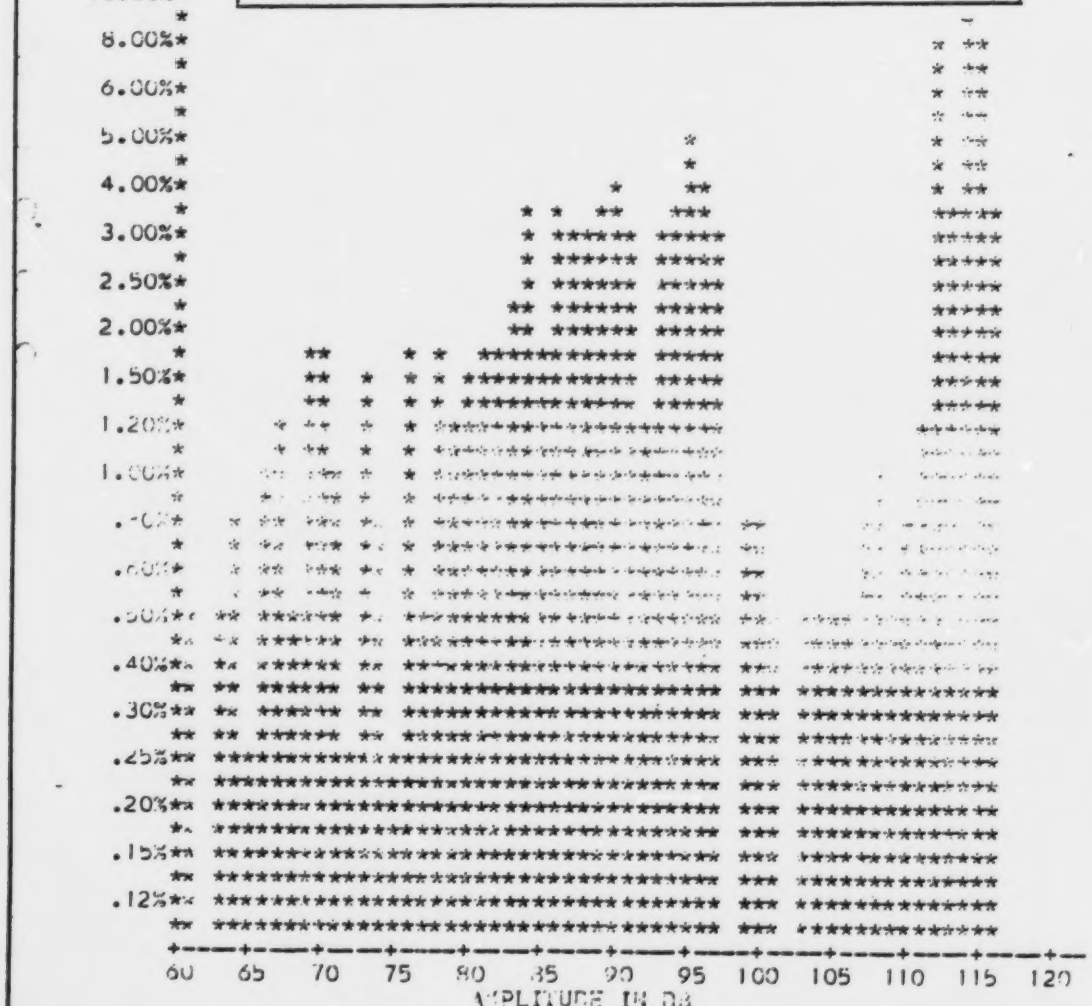
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
USER DOSE = 80 DB / [illegible]
INCREASE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

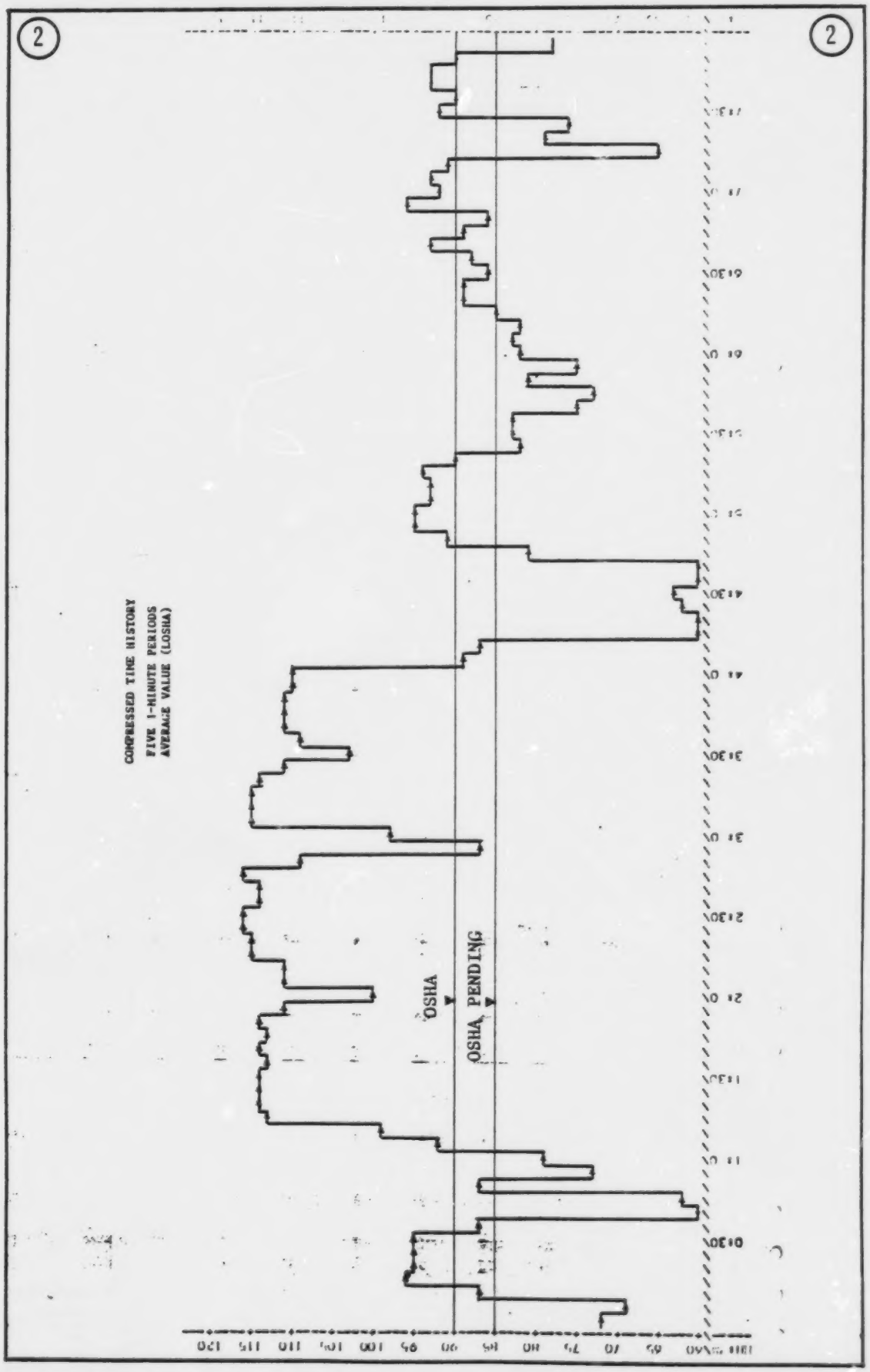
TIME	LEVEL		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIV
1	89.2	89.2	11.145	11.16
2	111.5	106.6	245.648	256.81
3	112.5	109.4	291.263	55[illegible].08
4	111.5	111.0	247.903	797.98
5	94.0	104.6	21.516	819.50
6	84.2	101.3	9.805	829.40
7	85.6	100.3	10.250	839.65
8	89.3	100.4	11.281	850.93

MIN. COMP. = 60 DB MAX. COMP. = 116 DB
ARITHMETIC MEAN = 91 DB
STD. DEVIATION = 17.05
VARIANCE =287 DB

(2) AMPLITUDE DISTRIBUTION (2)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
47	9.8	60 TO 64
19	4.0	65 TO 69
21	4.4	70 TO 74
22	4.6	75 TO 79
44	9.2	80 TO 84
61	12.7	85 TO 89
60	12.5	90 TO 94
50	10.4	95 TO 99
9	1.9	100 TO 104
13	2.7	105 TO 109
90	18.8	110 TO 114
44	9.2	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




2
2
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
11 0
11:30
12 0
12:30
13 0
13:30
14 0
14:30
15 0
15:30
16 0
16:30
17 0
17:30
18 0
18:30
120 115 110 105 100 95 90 85 80 75 70 65 60 55 HIGH %

(3)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225   60   64    4    1
     87      115200  480
 78  67  70  72  68  75  72  77  76  79  87  95  97  97  97  96
 97  97  97  97  96  93  96  96  95  96  96  96  97  98  96  84
 94  92  86  81  60  62  60  60  60  60  60  60  61  60  61  85
 94  89  70  83  77  73  72  77  73  74  68  66  70  70  95  96
 92  88  84  87  89  94  95 106 110 112 113 115 113 113 113 114
114 114 114 114 114 114 114 114 115 116 116 115 113 111 112 111
112 113 115 113 113 113 113 113 114 113 111 111 112 113 113 114
111 112 112 112 107  97  99  97  97  98  97 107 110 113 112 113
108  93 109 115 115 114 115 115 115 115 114 114 114 114 115 116
116 116 114 116 116 115 115 115 115 113 113 113 114 113 113 113
114 115 114 114 115 116 115 116 107 107 113 111  98  94  99  99
 91  89  92  92  89  87 112 114 115 115 115 116 115 115 115 115
116 115 115 115 115 115 114 113 113 112 112 110 113 111 110 109
104  93 104  93 109 111 111 106 103 100 106 111 111 111 111 111
111 111 106 111 111 111 110 111 107  93 107 110 110 110 110 110
103 105 108  80  93  93  95  95  95  97  97  94  73  61  60  75
 64  68  75  86  86 100  91  64  63  73  76  67  66  61  62  65
 60  60  63  72  75  73  61  63  68  61  68  66  63  67  70  73
 70  63  63  65  67  64  70  88  98  92  92  92  83  90  85  71
 78 101 109  99  94 101  97  92  92  92  90  96  97  93  92  90
 88  88  87  92  89  81  82  86  94  93  93  92  89  90  95  93
 91  81  60  76  60  60  60  62  66  74  70  79  81  77  77  45
 75  61  64  60  60  62  71  78  77  77  76  76  73  66  81  83
 82  79  69  65  82  82  82  83  85  93  96  87  89  91  91  86
 83  97  99  89  85  84  88  90  90  88  91  91  92  90  87  93
 95  96  97  92  86  93  98  95  81  76  81  88  94  95  96  97
 96  94  96  99  88  90  89  85  77  86  88  99  96  96  97  94
 88  68  60  72  79  76  73  77  79  84  74  63  66  63  69  70
 67  68  70  76  68  89  84  85  90  85  85  91  96  95  95  95
 95  98  97  95  93  92  93  92  80  69  68  79  76  74  81  82
$EOF
```

(3)

```
ENTER LOG DATE (DD/MM/YR) : 18/07/79
ENTER SITE CODE (5 CHARS) : CC201
ENTER USER CODE (4 CHARS) : 5146

 ENTER JOB CODE (3 CHARS) : 281
```

```
    DATA LOGGED :16 JULY 1979          DATA ANALYZED : 14 SEPT 1979
        LOGGER : 78-301/26                SITE CODE : CC201
SERIAL NUMBER : 1225                       JOB CODE : 281
      BASELINE : 60 DB                     USER CODE : 5146
DYNAMIC RANGE : 54 DB                      THRESHOLD : 60 DB
SAMPLING RATE : 4/SEC                  TOTAL SAMPLES =  1152 0
TEST DURATION =  [illegible]           STANDBY TIME =  [illegible]
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		ANTILOG	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	89.9	89.9	12.244	12.24
2	111.2	10[illegible]	236.030	24[illegible]
3	112.3	10[illegible]	275.114	52[illegible]
4	111.2	10[illegible]	237.342	761.58
5	89.8	10[illegible]	12.171	773.75
6	90.0	10[illegible]	13.980	787.73
7	90.7	10[illegible]	13.769	801.50
8	88.5	105.1	10.092	811.59

MIN. COMP. = 60 DB MAX. COMP. = 116 DB
ARITHMETIC MEAN = 91 DB
STD. DEVIATION = 17 DB
VARIANCE = 283 DB

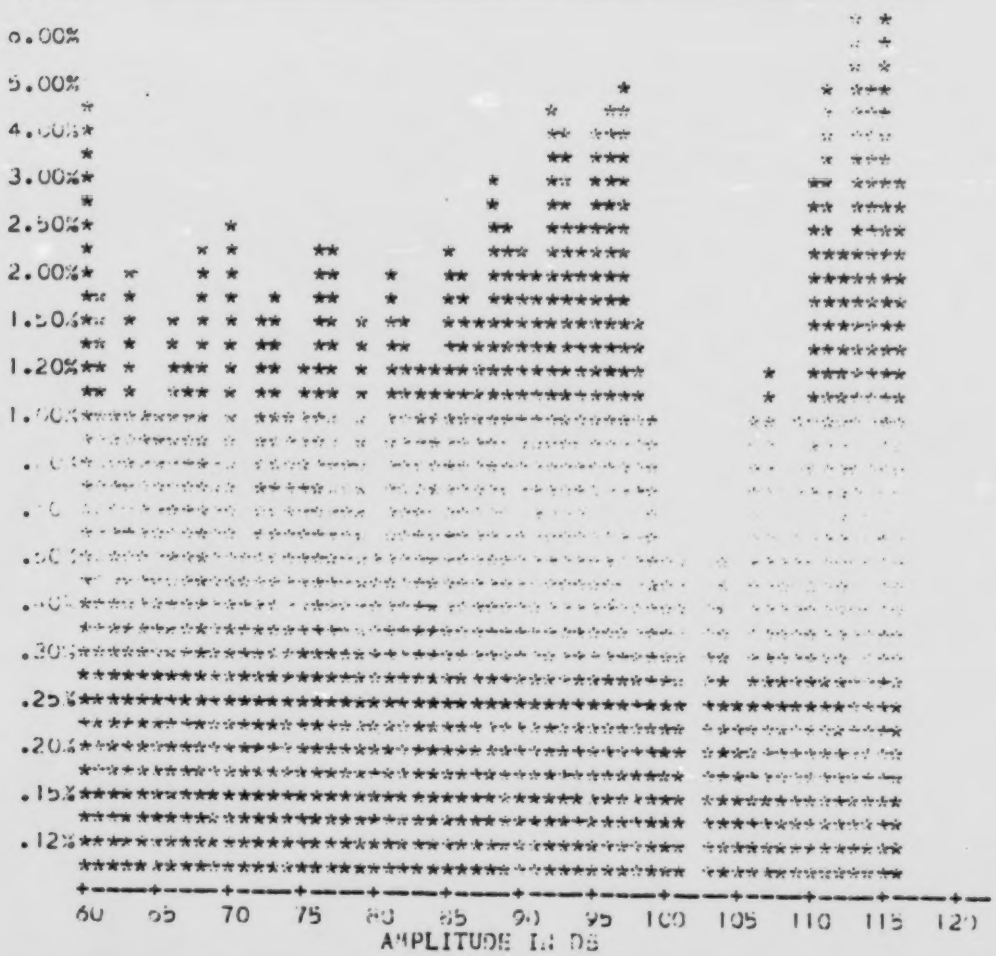
3

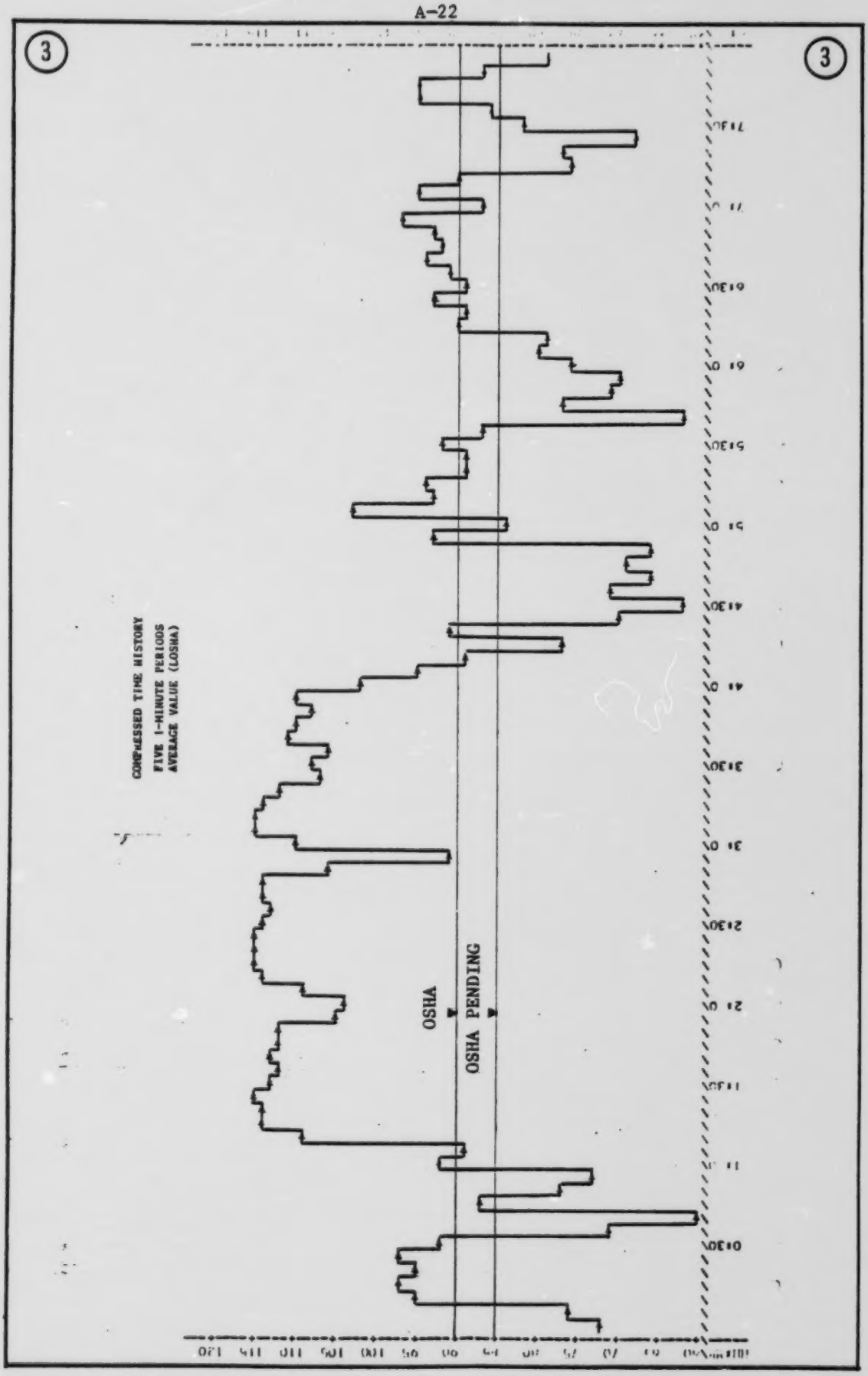
AMPLITUDE DISTRIBUTION

3

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
41	8.5	60 TO 64
27	5.6	65 TO 69
29	6.0	70 TO 74
32	6.7	75 TO 79
26	5.4	80 TO 84
45	9.4	85 TO 89
60	12.5	90 TO 94
64	13.3	95 TO 99
8	1.7	100 TO 104
17	3.5	105 TO 109
91	19.0	110 TO 114
40	8.3	115 TO 119

TOTAL NO. OF DATA POINTS = 480




3
3
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:30
2:30
3:30
4:30
5:30
6:30
7:30

(4)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1213    60    64     4     1
    1000      115200  480
  68  67  71  71  62  70  76  71  68  74  73  64  73  61  61  60
  61  62  63  68  71  68  68  67  76  86  87  89  91  92  98 100
  99  98  99  98  97  99  96  96  86  82  85  95  95  96  86  86
  84  79  77  80  80  81  81  85  92  87 103 102  99 105 104 106
 102 105 107 104 103 104 106 107 105 [illegible] 106 106 102 103 102 100
  87  89  84  98  87  84  92  93  98 104 106 107 103 109 107 100
 102 103 108 107 103 107 105 105 101  93  82  75  89  95  95  84
  72  64  64  86  86  83  81  86  78  96  95  84  81  83  92  93
  89  84  75  77  97  95  91  [illegible] 95 100  99  96 100 100 100 100
  99  99  95  98  88  79  71  81  81  84  80  80  79  72  96  91
  72  65  75  77  83  82  91  88  80  78  79  63  67  76  70  64
  67  79  80  97  99  96  91  83  91  92  72 102 101 105 103  98
  95  71  81  75  84  82  95  96  89  91  95 100  93  97  97  91
  86  75  77  68  77  84  79  79  75  65  75  70  69  66  73  88
  84  84  97  89  96  98  75  93  94  93 100 100  95  98  72  86
  81  83  82  87  88  90  99  97 100  99 100  98  99  99  97 100
  96  98  90  88  90  88  96  92  96  90  84  76  84  78  69  80
  84  84  78  79  76  66  69  73  86  89 100 104 104 103 105 105
 106 105 106 107 103 107 105 105 106 105 107 107 108 104 109 107
 109  96  83  74  65  80 102 106 109 109 107 100 107 103 104 106
 109 113 106 103 108 106 104 105 105 108 107 106 108 105 100 104
 107 104 105 107 107 105 105 107 106 106 105 107 111 102 105 107
 103  94 103 106 106 111 106 111 110 111 109 106 109 111 110 108
 105 111 109 107 108 110 110 109 108 108 105 110 111 109 106 109
 110 101 107 107 105 104 109 106 103 106 108 107 101 109 109 105
 103 103  95 101 105  99 102  95  92  87  83  77  91  95  93  93
  95  90  96  89  87  88  97  98  97 100 101  95  67  60  60  60
  60  63  63  60  60  60  60  61  67  60  60  60  60  60  60  60
  60  60  60  65  60  61  60  61  61  60  67  61  60  73  78  96
  95  93 102  96 100 101  99  93  88  80  65  60  60  68  73  79
EOF


ENTER LOG DATE (DD/MM/YR) : 18/07/79
ENTER SITE CODE (5 CHARS) : CC201
ENTER USER CODE (4 CHARS) : 2901
 ENTER JOB CODE (3 CHARS) : 281


    DATA LOGGED :18 JULY 1979                DATA ANALYZED : 14 SEPT 1979
         LOCKER : [illegible]-301/26              SITE CODE : CC201
  SERIAL NUMBER : 1213                             JOB CODE : 281
       BASELINE : 60 DB                          USER CODE : 2901
  DYNAMIC RANGE : 64 DB                          THRESHOLD : 80 DB
  SAMPLING RATE : 4/SEC                    TOTAL SAMPLES = 115200
  TEST DURATION = 08 HR 0                    STANDBY TIME = 01 HR


              TIME HISTORY ANALYSIS

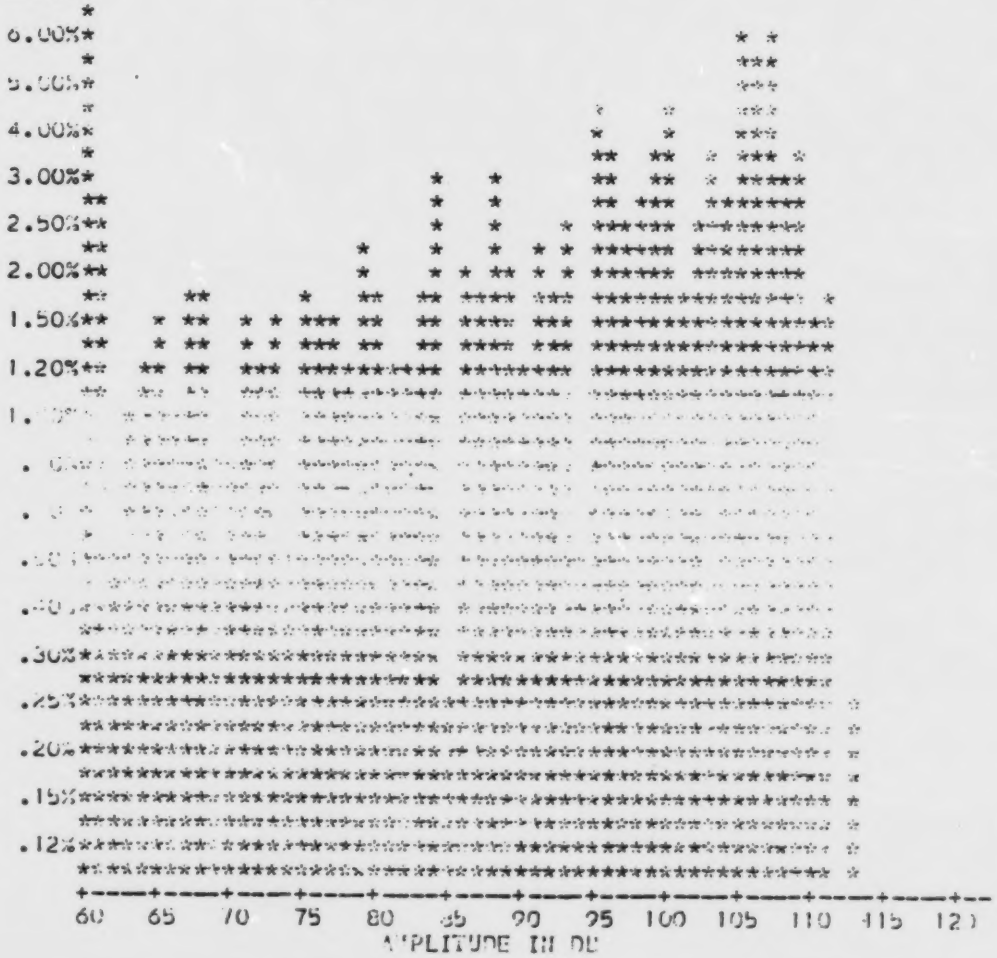
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
 TOTAL DOSE = 90 DB / 8 HRS
 EXCHANGE (CONTROL) RATE = 3 DB
 THRESHOLD (CUTOFF) LEVEL = 80 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD = 1 MINUTES

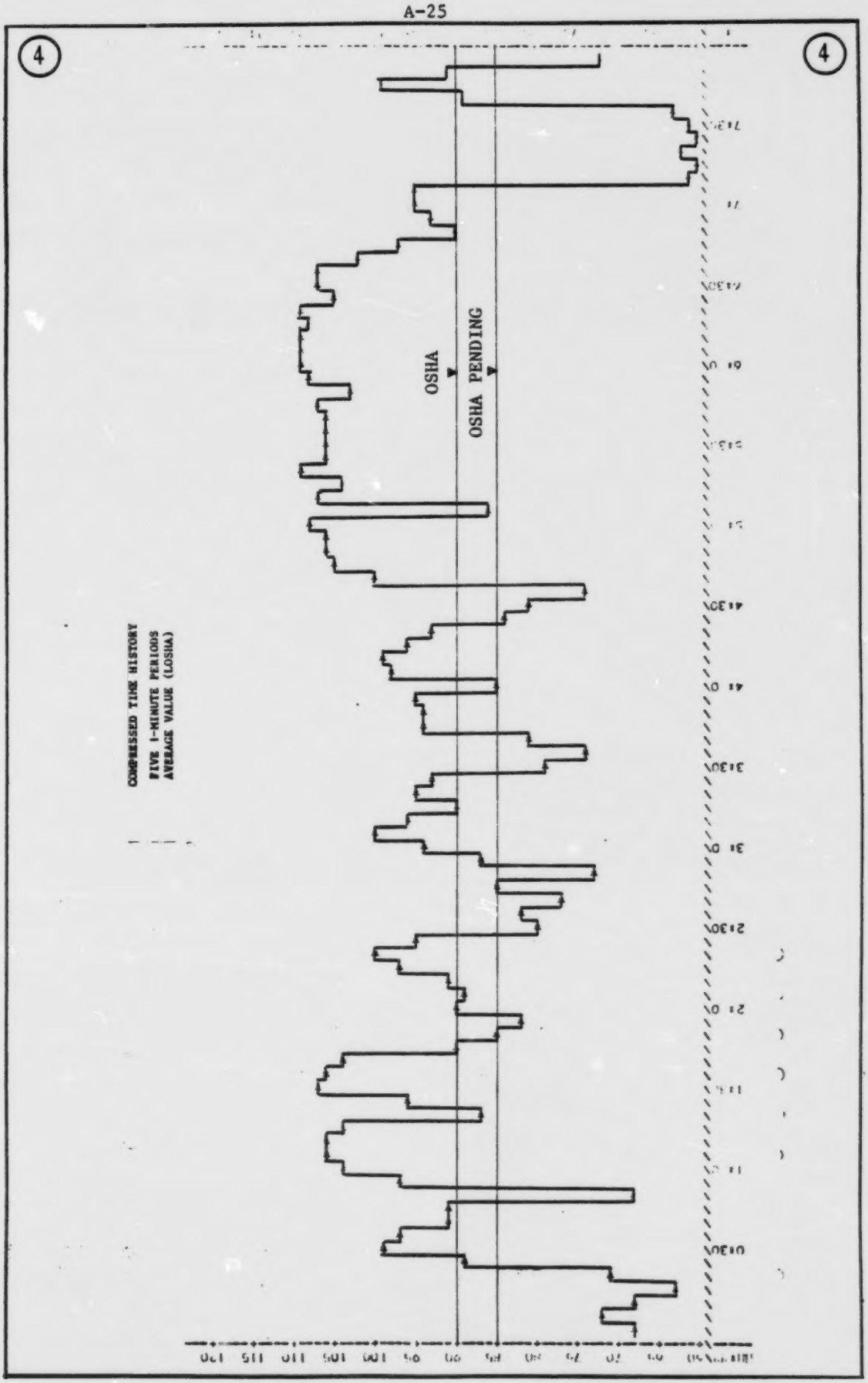
 TIME          LOGIA                        DOSE
 HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
    1        90.2        90.2        12.828        12.83
    2       102.0        98.3        44.111        56.94
    3        90.4        96.5        13.982        92.92
    4        93.1        95.8        19.134       112.06
    5        98.9        96.5        42.879       154.94
    6       105.9        99.2       112.798       267.74
    7       105.9       100.6       112.720       380.46
    8        -8.7        99.8        10.497       390.95
 MIN. COMP. =  60 DB                MAX. COMP. = 113 DB
 ARITHMETIC MEAN =  89 DB
 STD. DEVIATION =  13 DB
 VARIANCE =256 DB
```

(4)

4 AMPLITUDE DISTRIBUTION 4

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
49	10.2	60 TO 64
27	5.6	65 TO 69
22	4.6	70 TO 74
33	6.9	75 TO 79
37	7.7	80 TO 84
36	7.5	85 TO 89
33	6.9	90 TO 94
68	14.2	95 TO 99
61	12.7	100 TO 104
100	20.8	105 TO 109
14	2.9	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




4
4
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(5)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1226    60    64     4     1.
     24      115200   480
 80  74  75  67  61  71  65  66  69  74  73  76  79  74  81  86
 91  91  97 101 101 101  92  90  93  93  89  98  97  93  98  97
 99  99  98  97  97  95  97  96  94  90  88  80  80  81  89  84
 73  72  85  92  90  92  90  75  83  90  89  84  79  74  73  75
 79  76  77  75  75  79  85  84  86  81  83  84  81  77  81
 92  92  93  92  92  92  91  91  90  91  93  91  91  88  92  91
 91  91  92  91  86  95  90  86  80  90  86  87  84  87  85
 84  72  64  63  74  91  92  91  88  95  99  98  90  98  98  99
 88  86  92  96  93  92  93  95  93  96  93  96  93  92
 88  95  94  95  94  90  93  99 101  97  96  95  75  92  92  91
 91  92  92  92  91  90  89  90  91  90  91  98  97  97  98  94
 82  85  89  84  87  81  83  86  86  90  87  86  90  91  91  79
 74  86  86  86  85  89  91  92  87  80  88  89  89  86  87  83
 86  92  93  92  92  84  80  80  80  85  80  82  82  80  98 104
104 104 101 108 102 106 104 104 101  95  93  98  91  82  70  71
 91  98 109 104 104 104 105 109 108 106 104 102  94  92  98 111
103 103 103 102 103 106 104 103 101  94  95  95  94  97 107 106
103 101 103 107 106 105 104 100  91  78  89  86  90  84  91 106
105 103 103 103 101 107 108 105 103 101  95 105 102 105  99  98
103 102 100  96  87  87  80  73  80  74  77  69  64  65  83  76
 83  83  89  89  88  73  87  81  78  86  87  88  85  87  87  85
 60  60  60  74  79  81 100  95  46  60  69  91  80  83  85  60
 88 107 104 102  99 106 109 103 101 105 103 101 101  88 100 107
104 104 102  98 108 107 103 104 100 105 104 105 105 103  98  95
 96  95  94  89  99 107 107 104 104 103 107 105 105 102 100  97
108 105 105 106  99  96  83 104 110 105 103 102 106 104 101  86
 83  85  88 103 103 106 107 108 107 106 102  87 104 105 107 104
103 106 107 109 105 102 107 104 103 101  88 101 102 101  99  92
 77  63  61  73  90  93  61  60  65  66  70  86  90  91  89  91
 90  95  97  97  96  99 101 102  99 100 100 100  94  82  83  80
ECHO
```

(5)

```
ENTER LOG DATE (DD/MO/YR) : 19/07/79
ENTER SITE CODE (5 CHARS) : CC2C2
ENTER USER CODE (4 CHARS) : 4074
 ENTER JOB CODE (3 CHARS) : 231
```

```
    DATA LOGGED :19 JULY 1979          DATA ANALYZED : 14 SEPT 1979
         LOGGER : 38-301/24                SITE CODE : CC2C2
SERIAL NUMBER : 1226                        JOB CODE : 231
     BASELINE : 0 DB                       USER CODE : 4074
DYNAMIC RANGE : 14 DB                      THRESHOLD : 60 DB
SAMPLING RATE : 4/SEC                  TOTAL SAMPLES = 115200
TEST DURATION =   8: 0: 0              STARTUP TIME =  0: 0: 4
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

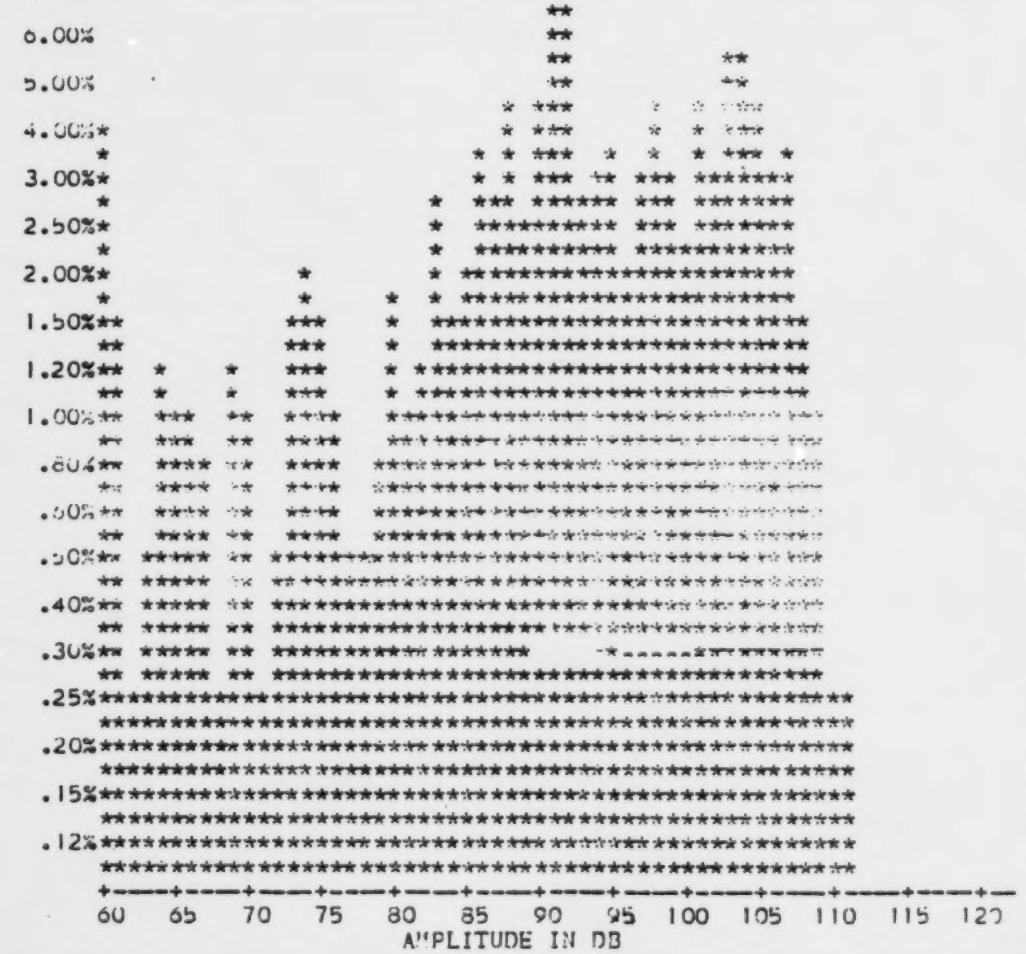
TIME	LOGA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	91.7	91.7	15.881	15.88
2	89.5	90.3	10.131	24.01
3	93.6	91.4	20.520	46.52
4	94.0	92.3	21.736	68.32
5	102.9	94.0	74.702	143.02
6	94.7	95.8	24.121	167.14
7	102.6	97.3	73.358	240.50
8	100.2	97.7	51.491	291.99

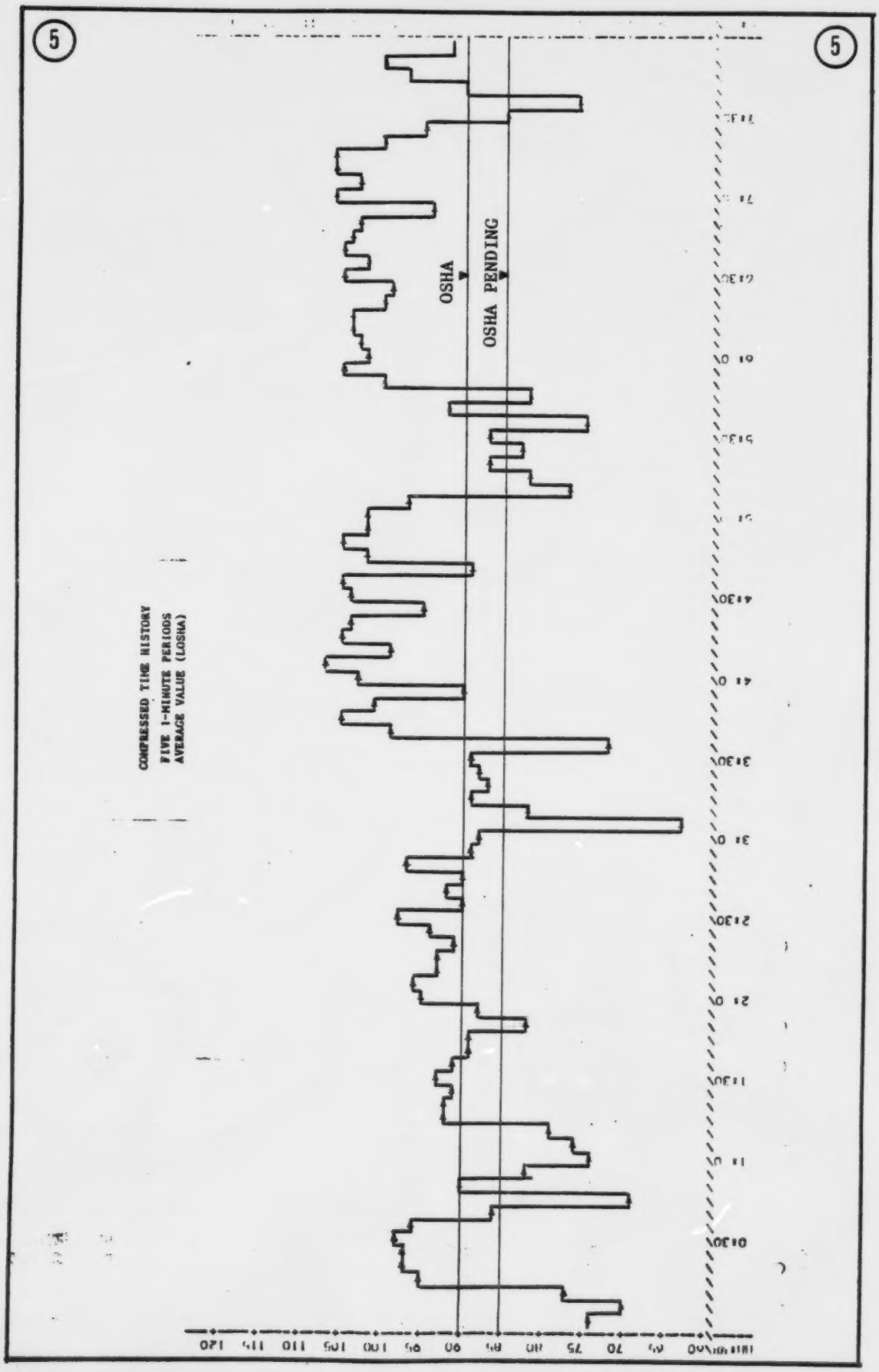
MIN. COMP. = 40 DB MAX. COMP. = 111 DB
ARITHMETIC MEAN = 90 DB
STD. DEVIATION = 13 DB
VARIANCE =169 DB

5 AMPLITUDE DISTRIBUTION 5

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
30	6.3	60 To 64
17	3.5	65 To 69
21	4.4	70 To 74
17	3.5	75 To 79
33	6.9	80 To 84
60	12.5	85 To 89
96	20.0	90 To 94
66	13.8	95 To 99
84	17.5	100 To 104
54	11.3	105 To 109
2	.4	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




5
5
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

(6)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
 1  26  80  1219    60    64     4     1
       55       115200   480
 69  66  74  75  80  74  77  80  73  77  72  73  63  76  79  79
 77  69  84  97 100  99  99  99 100 100  94  94  95  96 100  99
 98 100  99  98 100 101  98  99  98  98  98  96  90  88  73  82
 60  60  60  60  60  60  61  60  65  60  69  75  65  87  92  76
 95  87  [illegible]  84  89  93  92  88  81  86  80  80  80  80  80  80
 80  75  80  70  64  68  66  60  62  61  74  [illegible]  8  7  72  71
 64  72  62  80  84  85  80  80  80  80  79  87  7  76  62  61
 60  60  82  73  62  60  75  69  71  75  69  74  [illegible]  79  72  76
 [illegible]  [illegible]  71  70  76  80  68  80  80  80  80  80  61  80  80  80
 74  75  76  76  80  70  82  79  76  73  73  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
101  80  92  96  95  95  95  95  90  80  85  83  84  [illegible]  81  81
 93  92  85  85  75  85  89  87  85  82  73  83  95  79  89  91
 81  80  76  81  81  81  100  87  [illegible]  [illegible]  87  92  112  114  113  113
112 111 113 115 112 108 104 106 104  99  99 109 111 110 110 111
110 109 105 106 111 111 111 112 112 111 100 106 101 115 114 113
112 112 111 104 114 113 112 113 114 107 101 100 101 101 103 103
102 102 102 102  94  96  91  96  92  87  93  89  61  61  80  80
 60  60  60  60  60  60  62  60  63  60  60  60  65  60  60  60
 60  64  63  63  60  60  60  60  69  73  72  80  69  90  86  99
 [illegible]  81  [illegible]  92  [illegible]  71  [illegible]  87  97  97  94  85  84  83  83  81
 82  85  85  81  82  83  83  83  83  83  82  [illegible]  3  [illegible]  [illegible]  [illegible]
 83  84  84  83  84  83  84  82  82  82  83  85  76  81  82  82
 80  75  83  83  77  73  78  78  73  73  73  75  76  74  89  72
 72  66  76  73  84  88  84  89  88  88  93  83  94  92  89  92
 94  97  94  92  86  93  94  93  92  89  94  94  94  93  94  93
 91  91  93  89  95  89  83  83  83  83  80  63  73  91  98  95
 96  92  89  76  64  65  67  62  66  63  63  80  63  80  83  64
 61  63  62  70  80  80  81  80  63  80  74  66  61  80  80  64
 80  89  70  63  80  80  80  80  80  81  81  80  72  82  82  82
 82  89  84  87  85 100 105 102 102 104 107 109 107 108 107 106
EOF
```

(6)

```
ENTER LOG DATE (DD/MM/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC202
ENTER USER CODE (4 CHARS) : 4473
 ENTER JOB CODE (3 CHARS) : 272
```

```
   DATA LOGGED :19 JULY 1979                DATA ANALYZED : 14 SEP1 1979
        LOCALE : [illegible]-301/2o              SITE CODE : CC202
SERIAL NUMBER : 1219                             JOB CODE : 272
      CASELINE : 20 DB                           USER CODE : 4473
DYNAMIC RANGE : 54 DB                          THRESHOLD : [illegible] DB
SAMPLING RATE : 4/SEC                    TOTAL SAMPLES =  115200
TEST DURATION = [illegible] HR [illegible]          STARTING AT =  [illegible]:[illegible]
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE LEVEL (Time.I.) CALCULATIONS
AIR CASE OF THE POWDER
[illegible] = [illegible] / [illegible]
[illegible] = ([illegible]) [illegible] = [illegible]
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTE
```

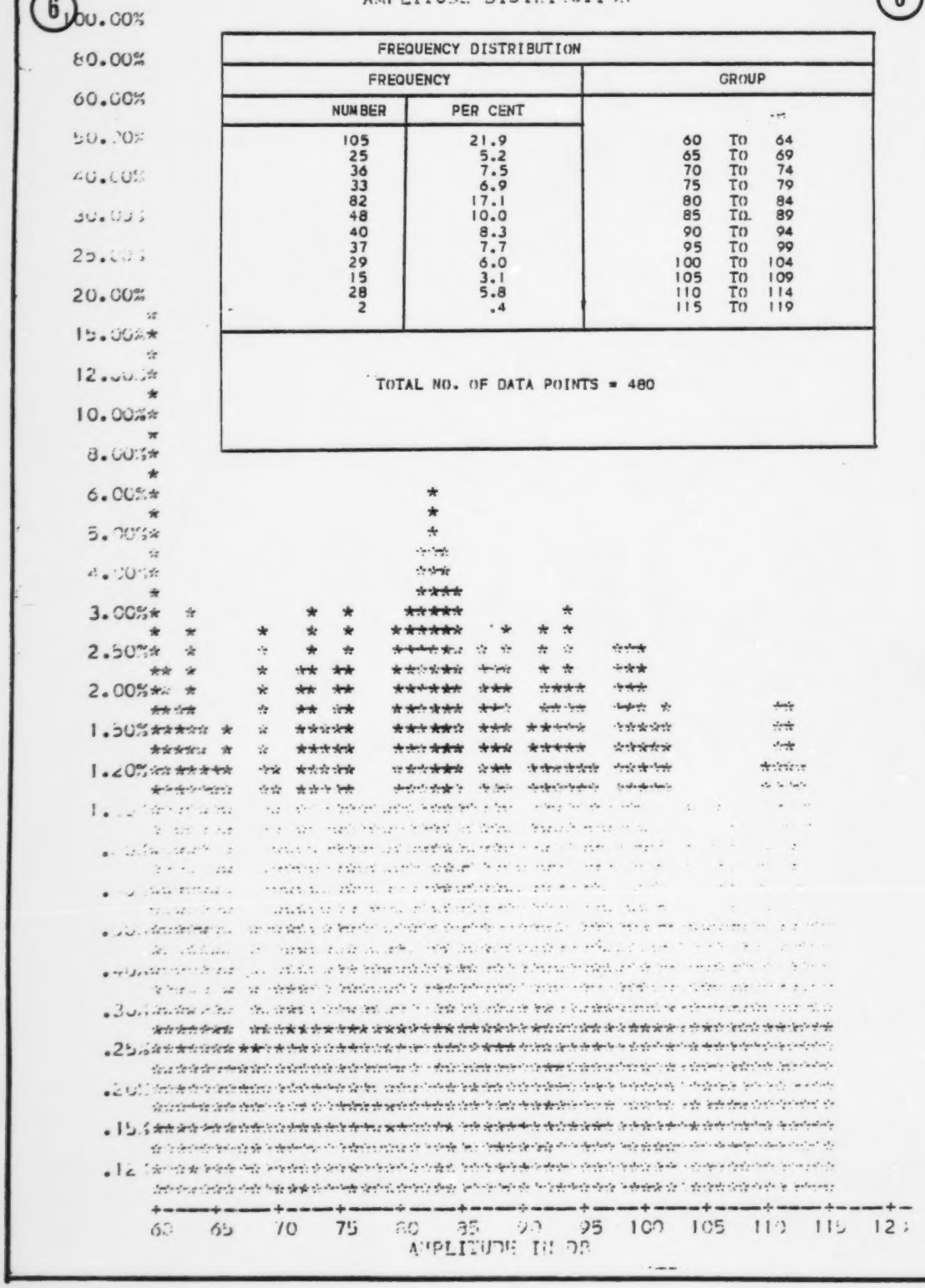
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	92.6	92.6	17.808	17.81
2	[illegible].1	[illegible].9	3.622	21.44
3	[illegible].1	87.8	[illegible].862	27.3[illegible]
4	100.7	96.1	126.116	153.21
5	100.8	98.7	55.640	209.86
6	[illegible].5	97.6	5.304	215.16
7	89.4	96.9	11.[illegible]	226.[illegible]
8	93.8	96.6	21.267	246.21

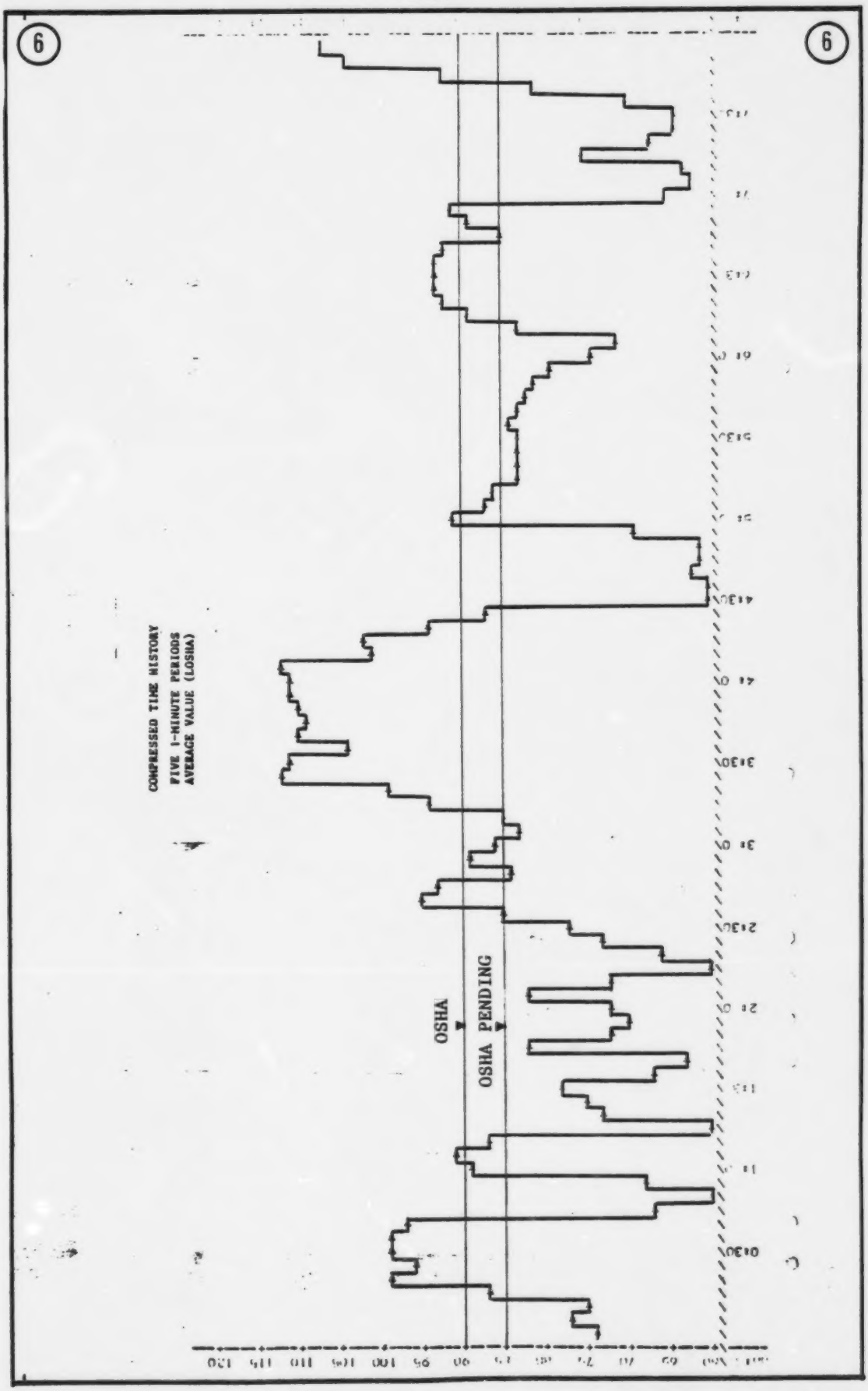
```
MIN. COMP. =  60 DB                    MAX. COMP. = 115 DB
ARITHMETIC MEAN =  91 DB
STD. DEVIATION =  [illegible]
VARIANCE =[illegible]
```

6 AMPLITUDE DISTRIBUTION 6

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
105	21.9	60 TO 64
25	5.2	65 TO 69
36	7.5	70 TO 74
33	6.9	75 TO 79
82	17.1	80 TO 84
48	10.0	85 TO 89
40	8.3	90 TO 94
37	7.7	95 TO 99
29	6.0	100 TO 104
15	3.1	105 TO 109
28	5.8	110 TO 114
2	.4	115 TO 119

TOTAL NO. OF DATA POINTS = 480




6
6
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
03:30
05:30
07:30
09:30
11:30
13:30
15:30
17:30
19:30
21:30
23:30
01:30

(7)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  121  60  66   4   1
     42      115200  480
  69  62  70  80  81  82  80  81  79  77  80  79  75  77  81  76
  60  75  80  64  77  78  72  71  79  83  79  76  75  78  82  79
  79  81  75  77  76  72  82  89 100  99  99  99 100  99  99  99
  99 100 101 102 102 101 100 101 101  96  99 103 100  94  85  72
  67  67  67  64  61  71  76  75  79  80  79  80  83 101  89  75
  77  82  81  80  76  83  80  86  75  81  81  83  81  81  82  85
  [illegible]
  [illegible]
  92  89  [illegible]  89  91  91  [illegible]  86  90  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
  92  91  93  94  93  92  91  91  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
  93  93  94  93  94  92  93  93  89  84  78  80  78  75  79  80
  [illegible]
 117 117 117 105  97 114 115 116 117 117 116 107 [illegible] 117 117 [illegible]
  [illegible] 117 117 117 117 109 106 116 114 117 109 117 117 117 117 117
 117 115 115 112 113 [illegible] 117 117 117 117 114 116 116 [illegible] [illegible] 117
 112 114 107 110 115 117 116 116 113 117 116 116  99  92  91  [illegible]
  91  92  93  96 116 116 116 117 100 110 117 116 117 115 117 116
 117 117 117 117 [illegible] 116 115 117 115 117 117 117 116 114  97  94
  94 103  89  82  77  85  87  76  76  74  71  73  71  72  63  70
  73  78  80  68  64  73  66  69  64  75  68  65  77  78  74  77
  69  74  86  88  62  80  99  99  89  93  93  92  94 111 117 [illegible]
 102 117 115 117 114 117 117 117 117 104 108 113 118 118 107 [illegible]
 119 116 116 116 116 118 117 116 115 [illegible] [illegible] [illegible] [illegible] [illegible] 117 [illegible]
 118 118 117 116 116 113 118 117 117 117 111 112 105 117 118 [illegible]
 117 114 115 118 117 117 111 111 116 118 115 119 114 118 119 119
 117 116 116 116 117 117 109  99  92  92  92  96 113 113 116 118
 118 117 117 116 113 117 116 117 117 118 118 118 117 116 116 117
 118 114 114 117 117 105 110 118 113 118 118 120 117 117 108 105
 110 107 112 100 114 115 116 117 113 117 116 117 117 116 117 115
 110 116 105  94  86  81  79  89 101  86  70  76  73  70  74  72
%EOF
```

(7)

```
ENTER LOG DATE (DD/MM/YR) : 19/07
79

ENTER SITE CODE (5 CHARS) : CC203
ENTER USER CODE (4 CHARS) : 4090

 ENTER JOB CODE (3 CHARS) : 281
```

DATA LOGGED :19 JULY 1900
LOGGER : [illegible]-301/26
SERIAL NUMBER : 1212
BASELINE : 60 DB
DYNAMIC RANGE : 60 DB
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

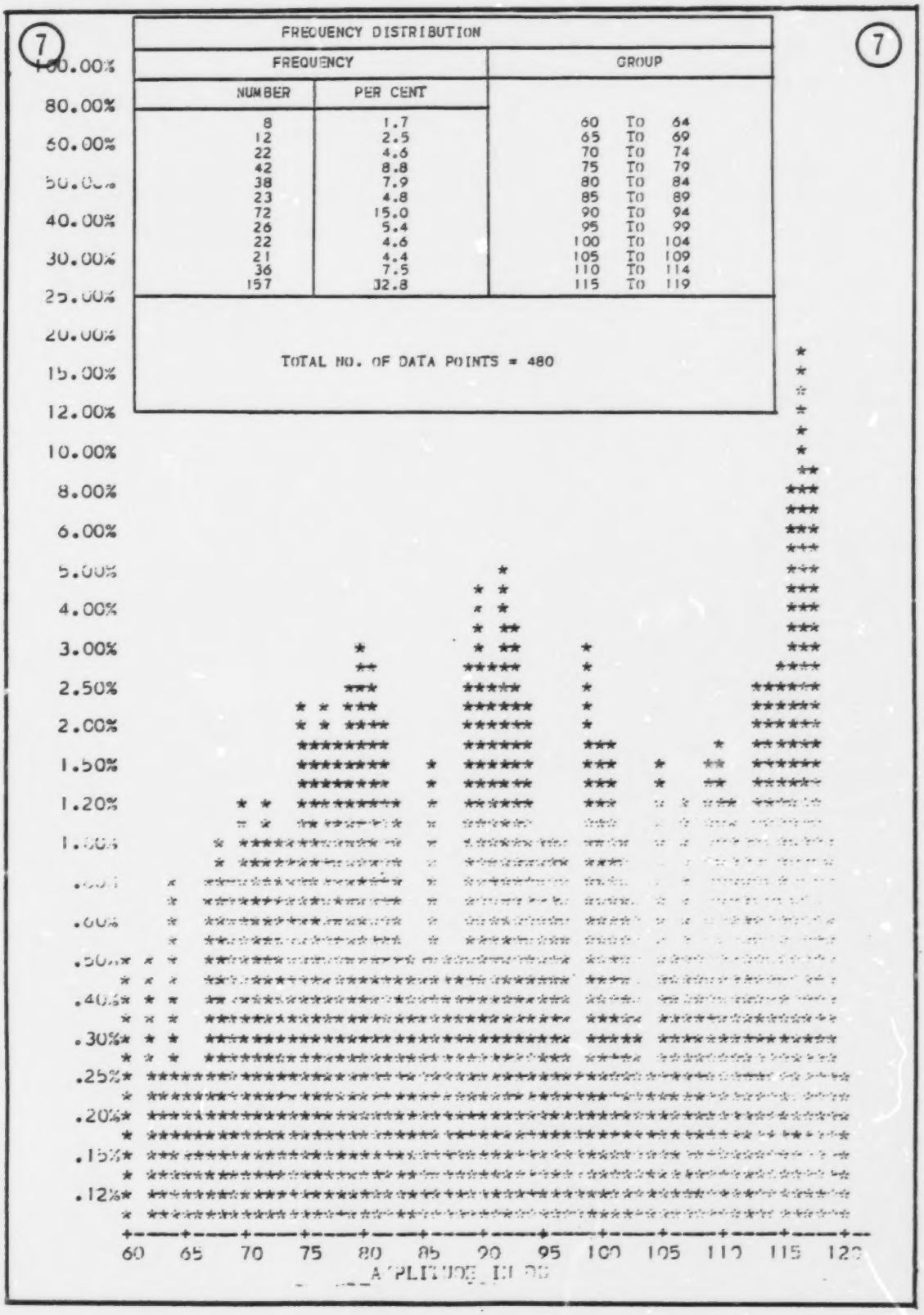
DATA ANALYZED : 14 SEPT 1979
SITE CODE : CC203
JOB CODE : 281
USER CODE : 4090
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

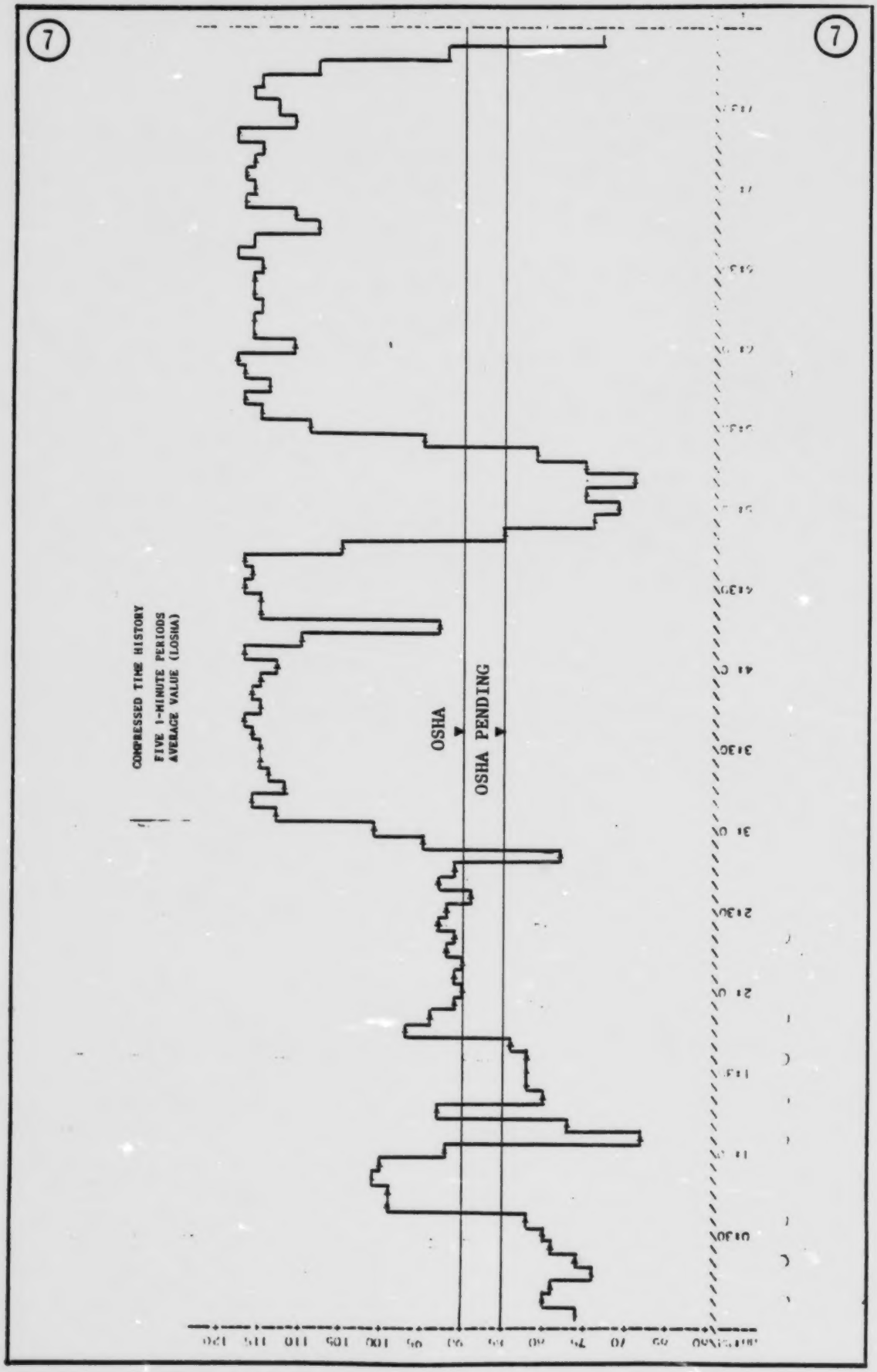
NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TRADE-OFF = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LEVEL		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	92.9	92.9	18.600	18.60
2	88.7	91.1	10.471	29.07
3	91.0	91.1	14.436	43.51
4	114.5	105.3	375.698	419.21
5	112.6	107.5	287.434	706.64
6	110.7	108.1	219.821	926.46
7	115.3	109.7	414.249	1340.71
8	113.7	110.3	336.094	1676.80

MIN. COMP. = 60 DB
MAX. COMP. = 120 DB
ARITHMETIC MEAN = 98 DB
STD. DEVIATION = 17 DB
VARIANCE =289 DB



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
8	1.7	60 To 64
12	2.5	65 To 69
22	4.6	70 To 74
42	8.8	75 To 79
38	7.9	80 To 84
23	4.8	85 To 89
72	15.0	90 To 94
26	5.4	95 To 99
22	4.6	100 To 104
21	4.4	105 To 109
36	7.5	110 To 114
157	32.8	115 To 119
TOTAL NO. OF DATA POINTS = 480		


7
7
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
18
21:30
21
31:30
31
41:30
41
120
115
110
105
100
95
90
85
80
75
70
65
60

(8)

```
PLACE TAPE IN READER THEN TYPE A <SPACE> AND A <RETURN>
  1  25  60  1213   60   64    4    1
     443      115200  480
 63  61  63  74  78  79  78  75  79  76  76  77  74  73  70  72
 66  69  75  79  76  75  69  73  65  61  68  74  66  67  80  86
 91  93  94  97  95  99  98  96  97  98  94  97  93 100  95  99
 91  62  63  66  60  60  60  60  60  60  60  60  60  60  60  60
 60  70  60  60  60  60  60  60  60  61  86  81  80  73  72  88
 95  91  [illegible]
 90  90  [illegible]
 97  89  [illegible]
 61  60  60  81 101  99  99 100  98 100  82  81  73  67  71  68
 [illegible]
 60  60  60  60  62  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  75  72  79  88 106 103  99 103
 [illegible]
107 106 102 104 106 107 105  96 107 107 107 102 100 107 106 102
103 107 108 103 108 106 103 102 107 106 101  99 102 108 106 104
 99  99  [illegible]
109 107 106 100 100 104 109 107 106  98  98 107 108 107 104 102
104 103 105 103 107 107 106 100 109 107 103 107 107 106 105 102
107 103 109 108 106 107 107 106 102 108 108 107 104 106 108 106
103 109 [illegible]
108 108 108 104 109 104 104  99 101 [illegible]
108 107 103 110 108 107 101 100 110 108 107 104 101 108 107 105
108 108 105 102 109 107 104 109 107 106 105 109 107 107 101 104
108 106 102 108 106 103 107 106 106  99 111 106 107 103 108 109
107 104 104 110 108 106 101  99 107 107 106  99 108 108 106 101
107 108 108 104 109 109 107 105 109 108 105 100 110 108 106 105
111 108 105 100  99  60  60  62  86  96  99  96  89 100  97  94
 93  92  95  98 101  84  62  64  62  60  60  60  60  60  60  60
 62  61  73  69  60  60  60  60  60  60  60  66  60  61  60  60
 60  65  60  60  60  61  77  75  76  72  71  60  60  82 100  93
<ECF
```

(8)

```
ENTER LOG DATE (DD/MO/YR) : 19/07/79
ENTER SITE CODE (5 CHARS) : CC204
ENTER USER CODE (4 CHARS) : 2401
 ENTER JOB CODE (3 CHARS) : 281
```

DATA LOGGED :19 JULY 1979
LOGGER : DR-301/2b
SERIAL NUMBER : 1213
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 1 DAY 0

DATA ANALYZED : 14 SEPT 1979
SITE CODE : CC204
JOB CODE : 281
USER CODE : 2401
RESOLUTION : 60 DB
TOTAL SAMPLES = 115200
SAMPLE TIME = 1 DAY

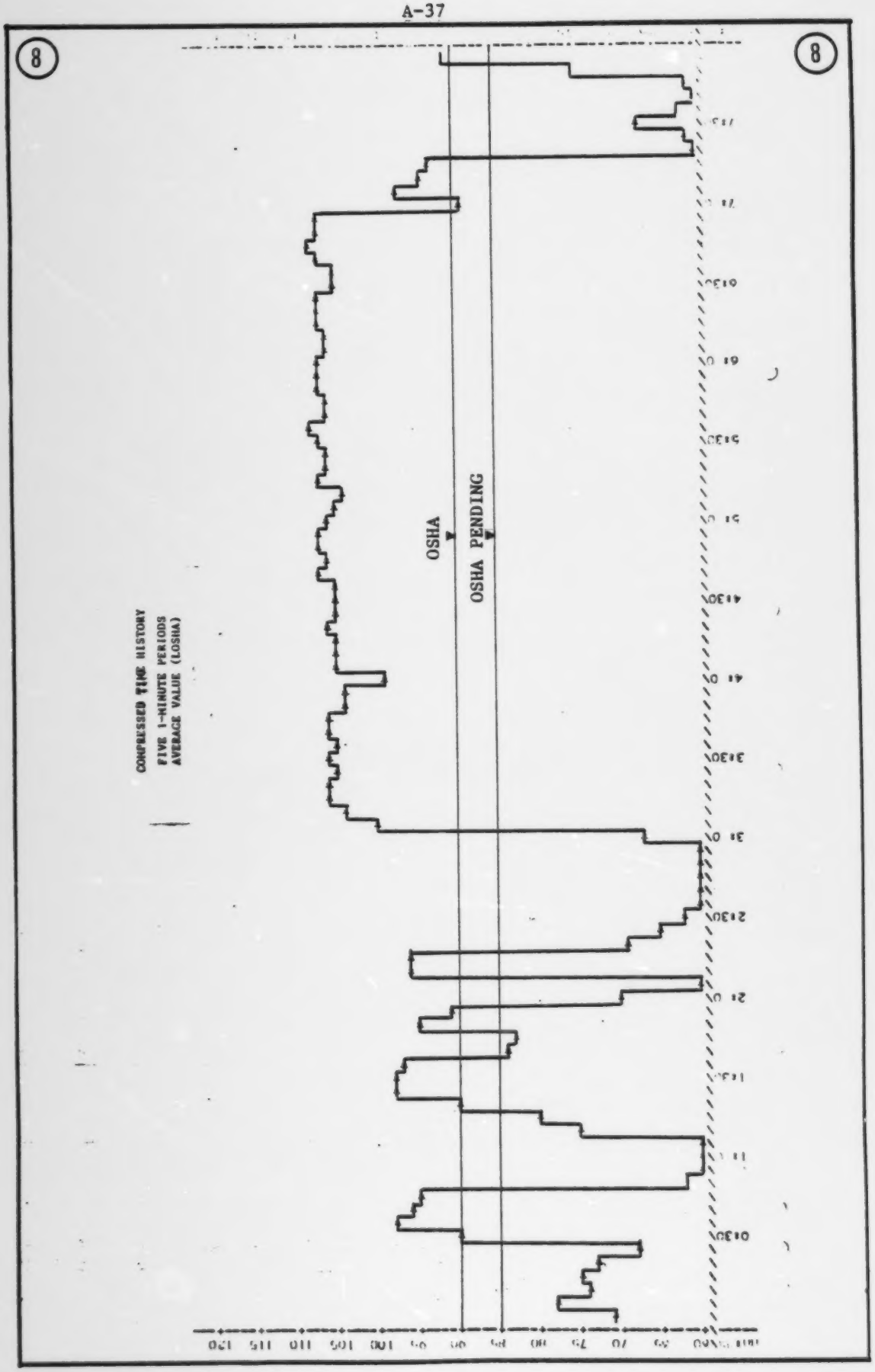
TIME HISTORY ANALYSIS

DOSE EXPOSURE I TEST (A.S.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
DOSE RESP = 20.0 / 3 HRS
REFERENCE (0 DB) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LOCAL CUMULANT	LOCAL CUMULATIVE	WORK CUMULANT	WORK CUMULATIVE
1	88.0	88.0	9.441	9.44
2	91.1	[illegible]	14.47	23.92
3	[illegible]	[illegible]	[illegible]	[illegible]
4	104.3	99.3	[illegible]	126.66
5	105.4	99.3	106.393	226.47
6	106.3	101.0	119.479	345.95
7	106.5	102.1	122.[illegible]	468.[illegible]
8	87.3	101.3	8.643	477.[illegible]

MIN. COMP. = 60 DB
MAX. COMP. = 111 DB
ARITHMETIC MEAN = [illegible] DB
STD. DEVIATION = [illegible]
VARIANCE = [illegible]

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
107	22.3	60 TO 64
16	3.3	65 TO 69
15	3.1	70 TO 74
19	4.0	75 TO 79
23	4.8	80 TO 84
7	1.5	85 TO 89
14	2.9	90 TO 94
60	12.5	95 TO 99
66	13.8	100 TO 104
147	30.6	105 TO 109
6	1.3	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


8
8
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
120
115
110
105
100
95
90
85
80
75
70
65
60
0130
1
1130
2
2130
3
3130
4
4130
5
5130
6
6130
7
7130

(9)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1   26   80  1225   60   64    4    1
      201      115200  480
 61   67   70   70   62   61   62   67   64   64   60   60   60   70   77   76
 76   80   70   74   68   77   76   65   72   68   72   74   73   66   69   70
 60   64   65   65   60   61   62   71   67   67   86   92   92   91   92   92
 92   92   91   89   95   93   92   92   93   95   76   86   71   81   82   82
 83   91   97   93   96  100  100   97   97   96   99   97   97   93   91   72
 66   72   70   67   63   62   73   63   69   65   75   65   86   94  103   94
 82   83   92   85   88   87   91   85   86   93   95   93   97  100  107  101
 10   111  114  115  116  116  116  116  116  115  115  115  116  116  115  116
 116  116  115  115  115  115  115  114  113  111  110   99  102  112  112  113
 114  115  114  114  114  114  113  114  115  114  115  114  113  113  112  110
 107  96   95   96  105   99   99  111  114  114  115  115  115  115  115  114
 114  115  115  114  113  113  113  112  112  112  110  110  111  114  115  115
 114  111  113  114  113  112  115  115  115  115  106  102  101  101  101  101
 101  101  101  101  101  101  101  100  100  100  100  100  111  114  115  114  112
 116  116  115  113  116  115  114  115  115  115  113  115  115  115  114  112
 115  115  114  114  115  115  112  113  115  115  114  114  113  111  101  112
 114  114  113  113  112  113  113  108  114  114  114  113  114  113  113  108
 111  114  114  114  113  113  113   99   95   94   94   94   94   94   94   94
  95   95   95   95   95   95   95   95   95   95   95   95   95   95   95   95
  95   95   95   95   95   95   95   95   95   95   95   95   95   95   95   95
  95   95   95   95   95   94   95   94   94   96   99   99   99   99   99  100
  99   98   95   95   95   95   96   96   96   96   96   96   95   96   96   96
  97   97   97   97   97   97   97   97   97   97   97   97   97   96   97   96
  96  104  111  113  113  113  112  112  112  110  109  105   95   94   94   94
  96   96   97   95   95   98  108  112  112  112  113  113  113  112  111  111
 112  111  111  113  112  112  112  111  111  109  111  110  108  107  108  111
 111  109  111  110  111  112  112  112  111  113  112  112  113  113  112  112
 112  110  105  109  110  111  111  110  110  110  110  110  109  102   97  108  110
 111  111  110  113  114  113  113  108  111  110  114  114  114  115  112  114
 112  115  112   97   83   80   92   98   97   87   75   69   80   62   62   92
%EOF


ENTER LOG DATE (DD/MO/YR) : 12/07/79

ENTER SITE CODE (5 CHARS) : CC220

ENTER USER CODE (4 CHARS) : 4174
 ENTER JOB CODE (3 CHARS) : 270


   DATA LOGGED :12 JULY 1979                DATA ANALYZED : 12 SEPT 1979
        LOGGER : SS-301/26                      SITE CODE : CC210
SERIAL NUMBER : 1225                            JOB CODE : 270
      BASELINE : 60 DB                         USER CODE : 4174
 DYNAMIC RANGE : 94 DB                        THRESHOLD : 80 DB
 SAMPLING RATE : 4/SEC                    TOTAL SAMPLES = 115200
 TEST DURATION =   8: 0: 0                  STANDBY TIME =  0: 0:50

          TIME HISTORY ANALYSIS

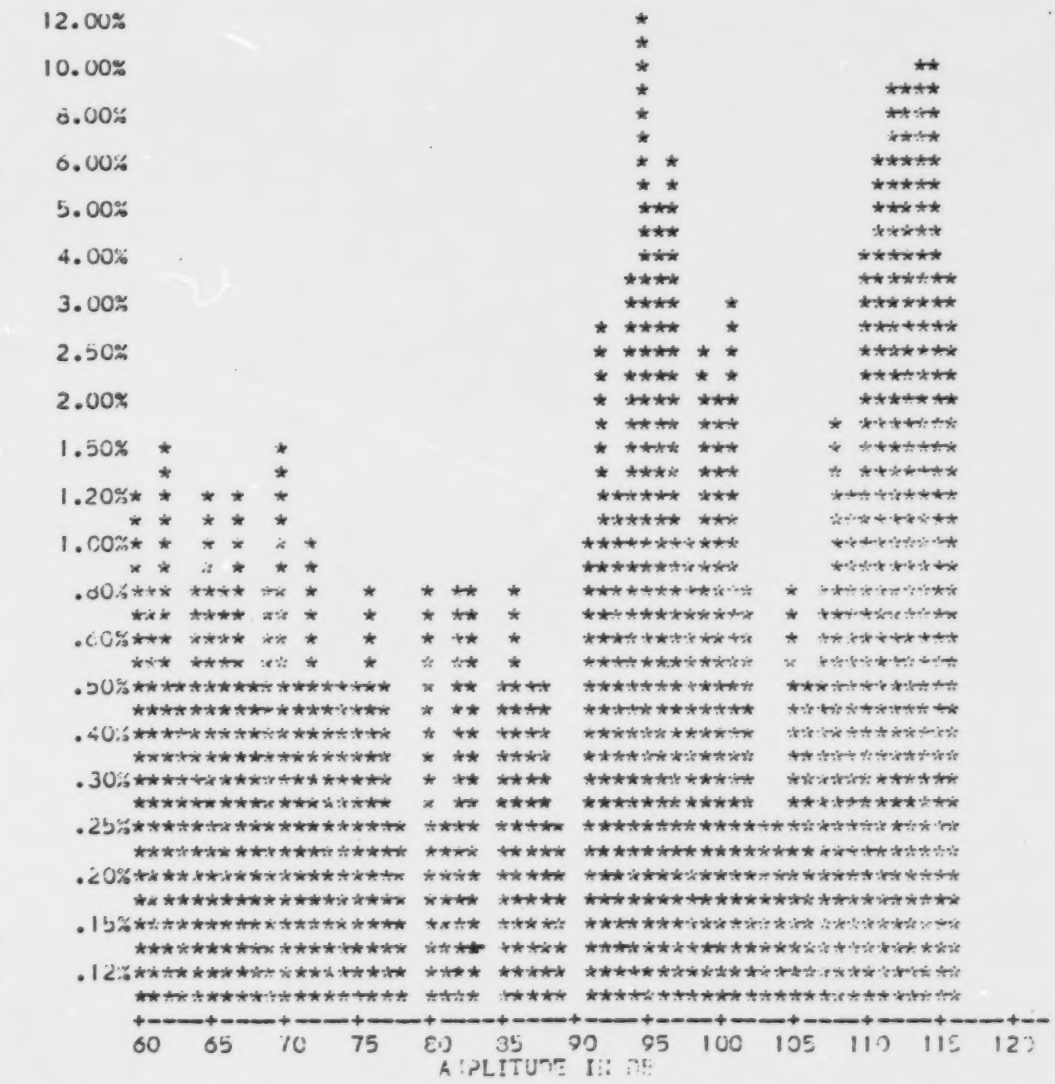
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

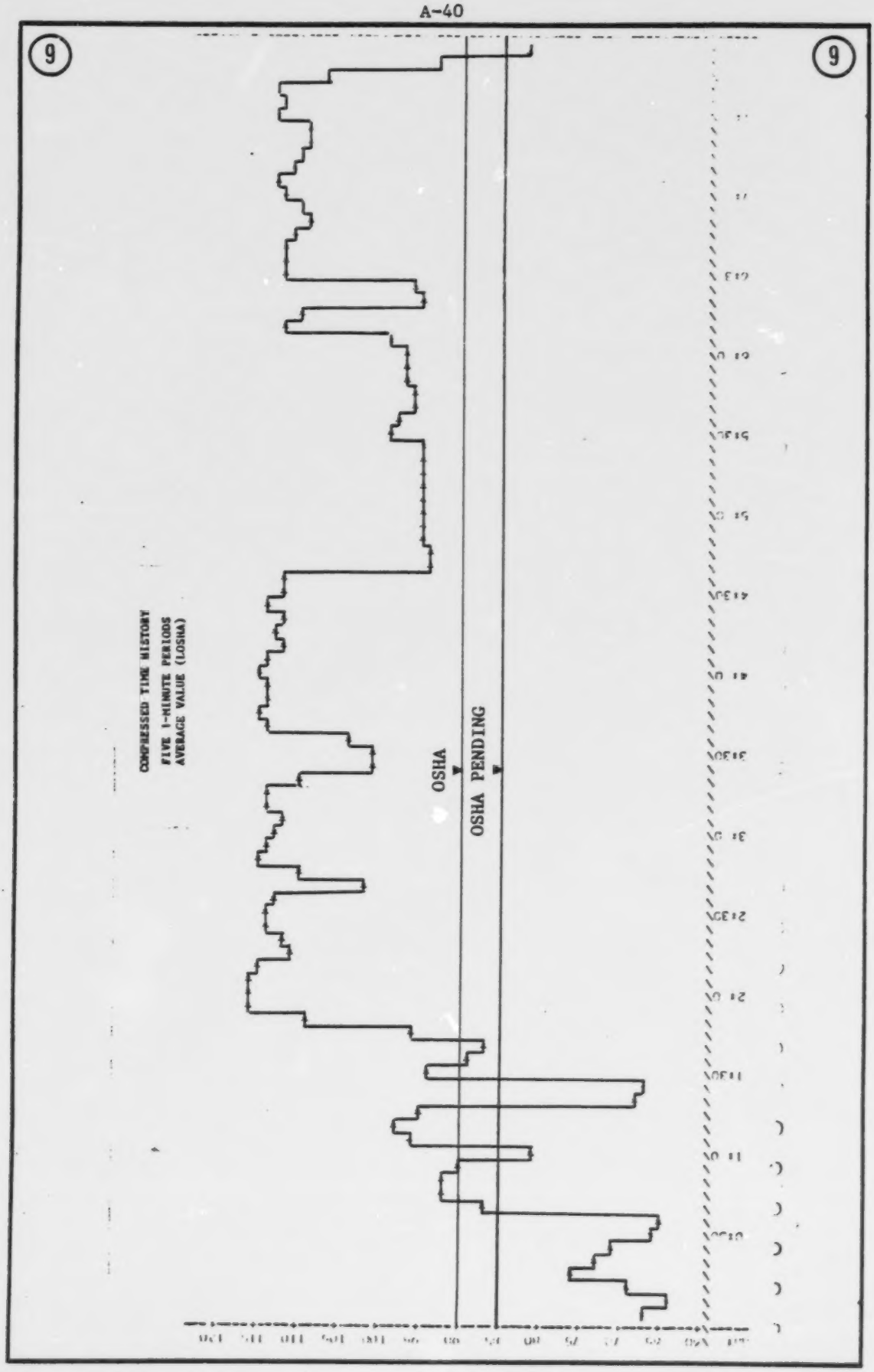
TIME          LOSHA                          DOSE
HOUR     CURRENT  CUMULATIVE        CURRENT  CUMULATIVE
   1       83.4      83.4           5.035      5.04
   2      102.0      97.5          69.704     70.74
   3      113.3     100.8         315.846    386.59
   4      111.2     104.5         260.347    646.97
   5      110.4     106.9         211.620    858.59
   6       96.1     107.8          29.007    887.60
   7      103.7     108.0         136.490   1024.09
   8      102.6     108.2         196.671   1220.75
MIN. COMP. =  80 DB                MAX. COMP. = 116 DB
ARITHMETIC MEAN =  99 DB
STD. DEVIATION =  15 DB
VARIANCE =225 DB
```

(9)

(9)

FREQUENCY DISTRIBUTION			(9)
FREQUENCY		GROUP	
NUMBER	PER CENT		
19	4.0	60 TO 64	
18	3.8	65 TO 69	
16	3.3	70 TO 74	
8	1.7	75 TO 79	
10	2.1	80 TO 84	
10	2.1	85 TO 89	
35	7.3	90 TO 94	
109	22.7	95 TO 99	
26	5.4	100 TO 104	
20	4.2	105 TO 109	
153	31.9	110 TO 114	
56	11.7	115 TO 119	
TOTAL NO. OF DATA POINTS = 480			




9
9
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(10)

PLACE DATA IN HEADER THEN TYPE A "SPACE" AND A "RETURN"

(10)

```
  1  29  30  1217   60   64    4    1
   20551     101434  422
  60  63  64  63  60  60  60  70  60  60  60  61  60  64  60  60
  64  69  60  72  69  73  61  61  62  67  77  97  77  69  64  72
  69  67  62  60  71  66  65  65  75  73  72  70  71  74  75  77
  75  65  63  66  65  66  70  72  74  68  74  78  83  90  99  97
  68  60  62  62  60  61  60  60  60  60  94  89  88  86  88  92
  89  65  87  84  84  85  90  92  93  76  60  60  60  60  60  60
  60  70  71  79  64  60  60  60  60  60  60  60  60  60  60  77
  89  89  89  90  86  80  60  60  60  60  60  60  87  89  90  89
  82  81  60  60  60  60  60  60  60  87  89  89  82  60  60  60
  60  60  60  81  89  89  86  63  60  60  60  60  60  60  90  77
  90  88  89  90  89  84  86  89  87  88  87  85  83  83  93  85
  81  80  80  80  94  83  79  78  80  86  86  60  80  84  85  84
  84  83  87  85  86  84  85  88  87  87  89  92  92  90  90 106
 110 111 111 111 110 110 110 111 111 111 108 110 110 111 111 111 110
 110 111 110 110 110 111 111 110 109 109 111 111 111 110 111 109
 106 109 111 112 111  94  87  87  87  84  75  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60 105 111 111 111 110 109 109 106 112 111 110 111 110
 110 108 111 112 109 107 106 108 108 100 105 107 109 106 106 107
 108 108 106 108 102  88  86  86  87  89  96 105 106 106 105 101
  86  95  91  70  75  74  73  77  73  77  72  71  78  67  79  74
  78  75  93  99  94  96  97  96  96  96  95  80  81  75  72  84
  86  94  95  78  83  86  74  71  70  82  81  76  73  79  79  78
  78  79  79  69  81  63  60  64  75  79  66  77  69  65  60  64
  60  60  60  60  60  60  60  60  61  60  66  60  64  66  60  60
  60  60  60  60  60  62  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
$EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 13/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4290
 ENTER JOB CODE (3 CHARS) : 271
```

```
    DATA LOGGED :13 JULY 1979          DATA ANALYZED : 12 SEPT 1979
        LOGGER : 08-301/26                SITE CODE : CC210
SERIAL NUMBER : 1217                       JOB CODE : 271
      BASELINE : 60 DB                    USER CODE : 4290
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  101434
TEST DURATION =   7: 2:30             STANDBY TIME =   1:25:37
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOCR LOSS = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 422
PERIOD =  1 MINUTES
```

TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	73.5	73.5	1.277	1.28
2	83.9	80.5	5.383	6.66
3	82.9	81.4	4.699	11.36
4	106.2	96.8	117.651	129.01
5	99.6	97.5	47.177	176.19
6	103.2	98.8	78.096	254.28
7	81.3	97.8	3.722	258.00
8	61.1	97.8	.008	258.01

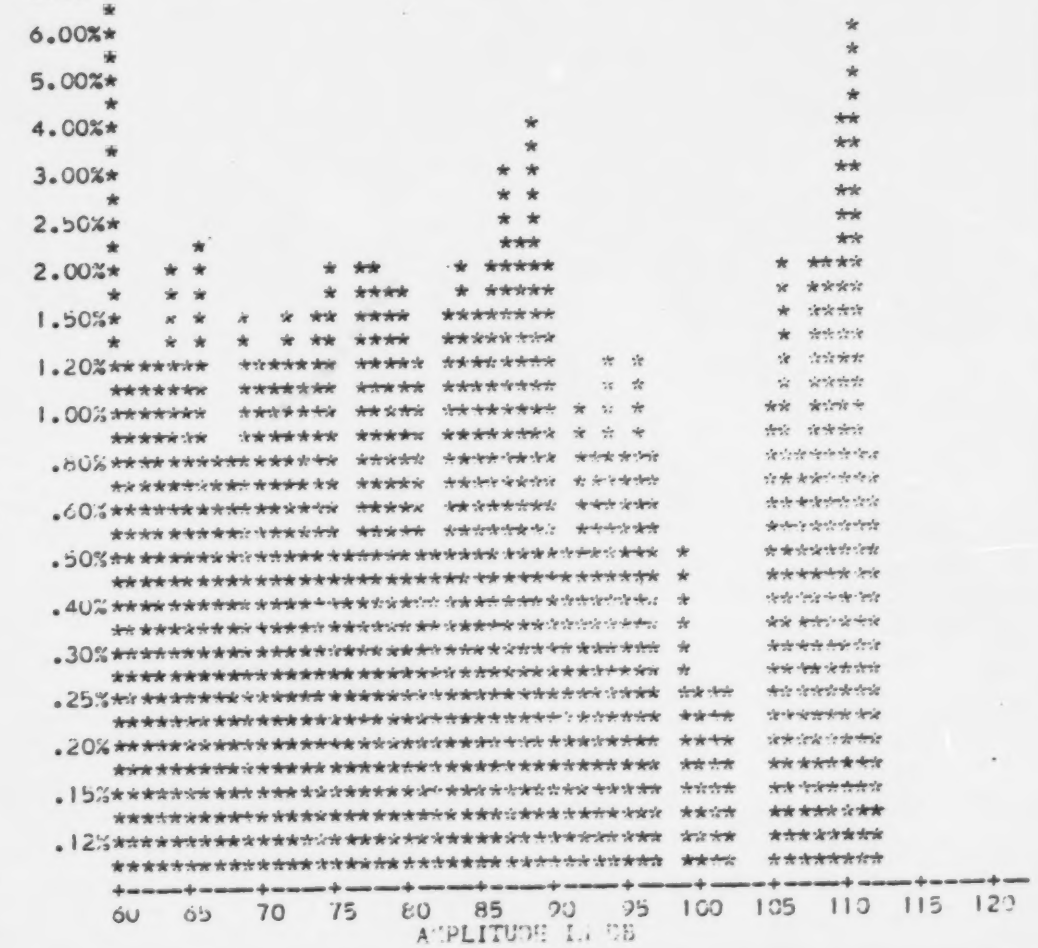
MIN. COMP. = 60 DB MAX. COMP. = 112 DB
ARITHMETIC MEAN = 79 DB
STD. DEVIATION = 13 DB
VARIANCE = 324 DB

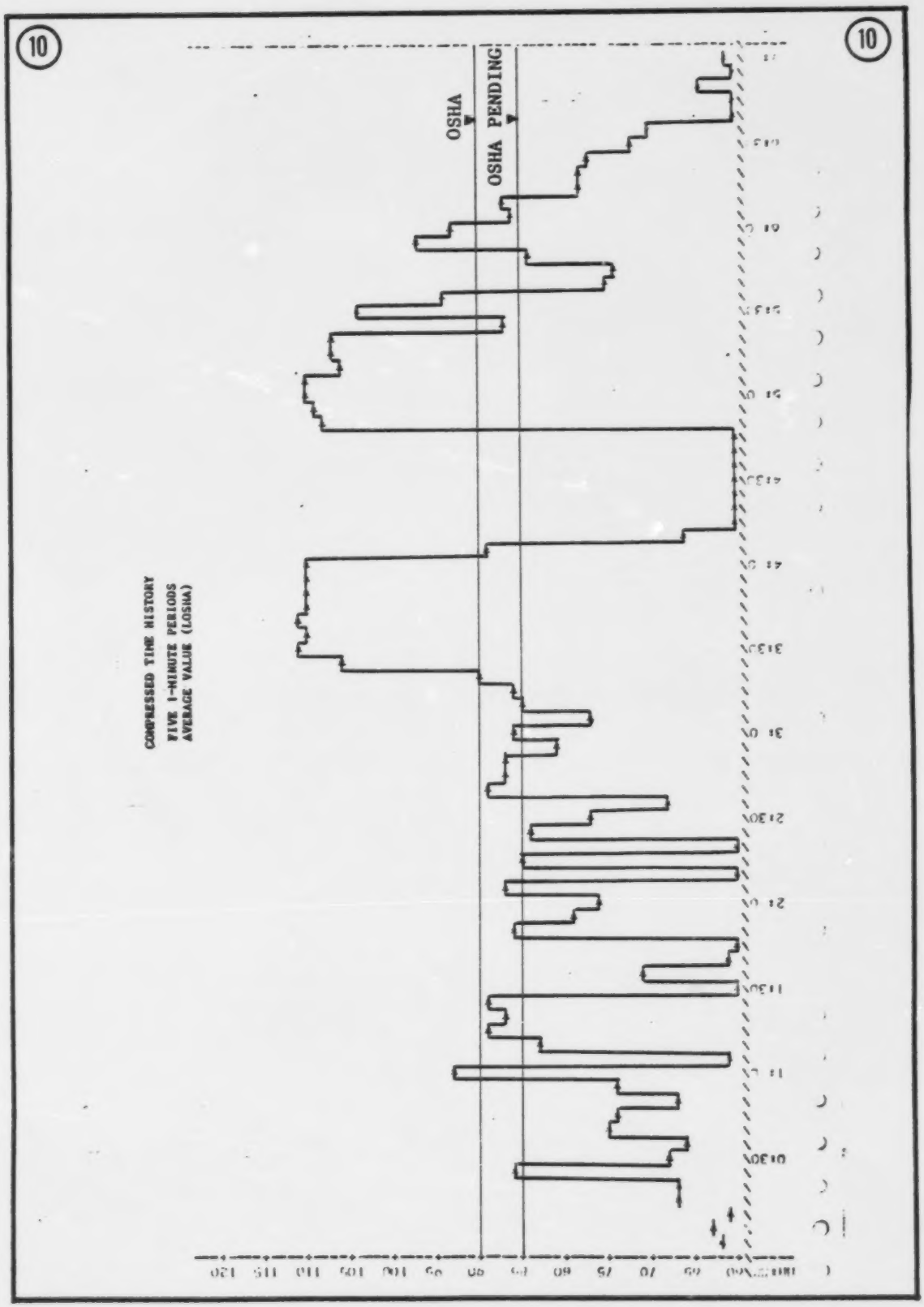
AMPLITUDE DISTRIBUTION

(10) (10)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
203	42.3	60 TO 64
26	5.4	65 TO 69
27	5.6	70 TO 74
33	6.9	75 TO 79
28	5.8	80 TO 84
51	10.6	85 TO 89
22	4.6	90 TO 94
13	2.7	95 TO 99
3	.6	100 TO 104
31	6.5	105 TO 109
43	9.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




10
10
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
01:30
11:30
21:30
31:30
41:30

(11)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(11)

1	26	60	1212	60	64	4	1								
	44		115200	480											
62	60	60	60	67	64	60	60	61	60	63	65	60	60	71	60
70	72	70	71	66	66	65	60	69	60	70	76	62	60	71	91
93	93	93	94	94	95	102	102	101	102	101	99	102	101	100	99
84	73	74	72	81	74	70	67	77	68	71	72	67	73	74	71
74	82	76	70	76	79	74	71	77	79	72	65	60	67	68	71
66	68	69	77	81	78	90	97	89	95	82	85	85	86	86	87
88	87	84	87	85	85	82	85	86	92	89	91	91	91	93	97
96	112	114	113	113	114	115	115	113	116	116	114	115	115	115	115
114	114	114	113	112	112	114	114	113	114	112	114	114	114	112	113
111	112	113	112	114	114	115	116	114	113	115	115	115	114	115	114
114	111	111	115	113	112	113	113	112	114	114	114	114	114	113	110
102	109	110	109	110	110	110	110	110	110	110	96	90	94	93	92
90	103	109	109	109	112	115	114	111	112	112	112	112	111	111	113
112	113	111	113	109	112	111	114	114	111	111	115	111	109	96	110
112	112	113	109	111	112	109	109	109	110	109	110	110	109	109	109
107	105	102	93	92	91	91	92	89	99	91	88	86	81	80	82
86	84	82	88	87	88	83	84	89	97	93	100	89	78	71	75
76	61	62	62	64	60	60	70	65	71	77	71	66	68	61	64
68	75	60	66	67	63	65	65	65	68	61	66	61	67	73	72
77	73	72	73	76	73	74	76	76	74	89	95	101	93	81	89
92	101	98	95	93	94	97	90	91	97	89	91	89	89	90	89
93	92	93	93	91	91	91	91	91	91	91	91	91	92	92	92
92	92	92	92	92	92	92	91	92	93	89	89	89	90	89	89
90	90	90	90	90	91	90	90	90	91	87	82	82	82	82	80
82	83	85	84	83	82	82	81	82	85	81	82	83	85	83	84
84	85	84	84	83	87	82	84	87	88	73	75	73	73	60	79
82	74	66	68	62	86	71	81	85	85	84	83	82	69	64	76
83	80	73	60	72	60	71	65	60	65	60	60	60	60	60	68
60	60	60	74	69	60	60	62	60	65	61	60	60	65	60	60
62	65	65	60	61	62	63	64	60	60	60	60	60	60	61	67

*EOF

ENTER LOG DATE (DD/MM/YR) : 13/07/79
ENTER SITE CODE (5 CHARS) : 00210
ENTER USER CODE (4 CHARS) : 7086
ENTER JOB CODE (3 CHARS) : 281

C

DATA LOGGED :13 JULY 1979
LOGGER : DB-3C1/26
SERIAL NUMBER : 1212
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 12 SEPT 1979
SITE CODE : 00210
JOB CODE : 281
USER CODE : 7086
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:11

TIME HISTORY ANALYSIS

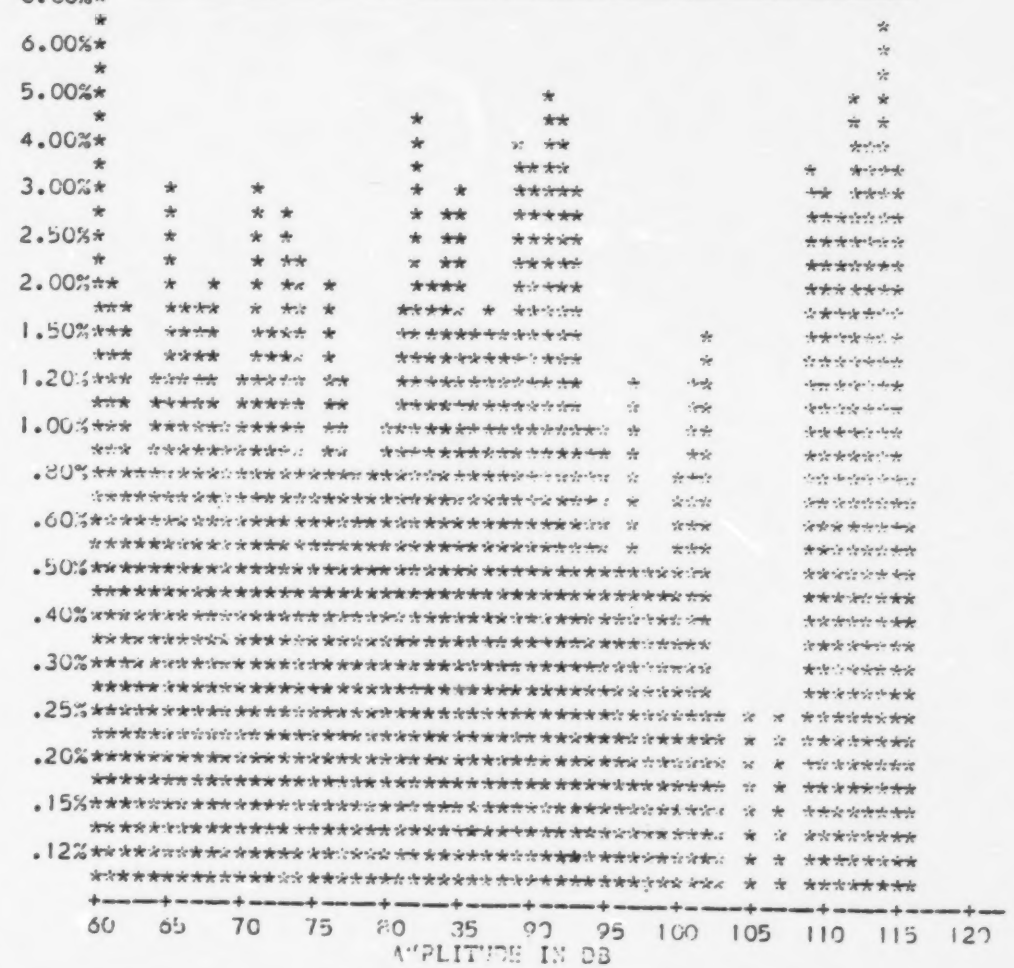
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

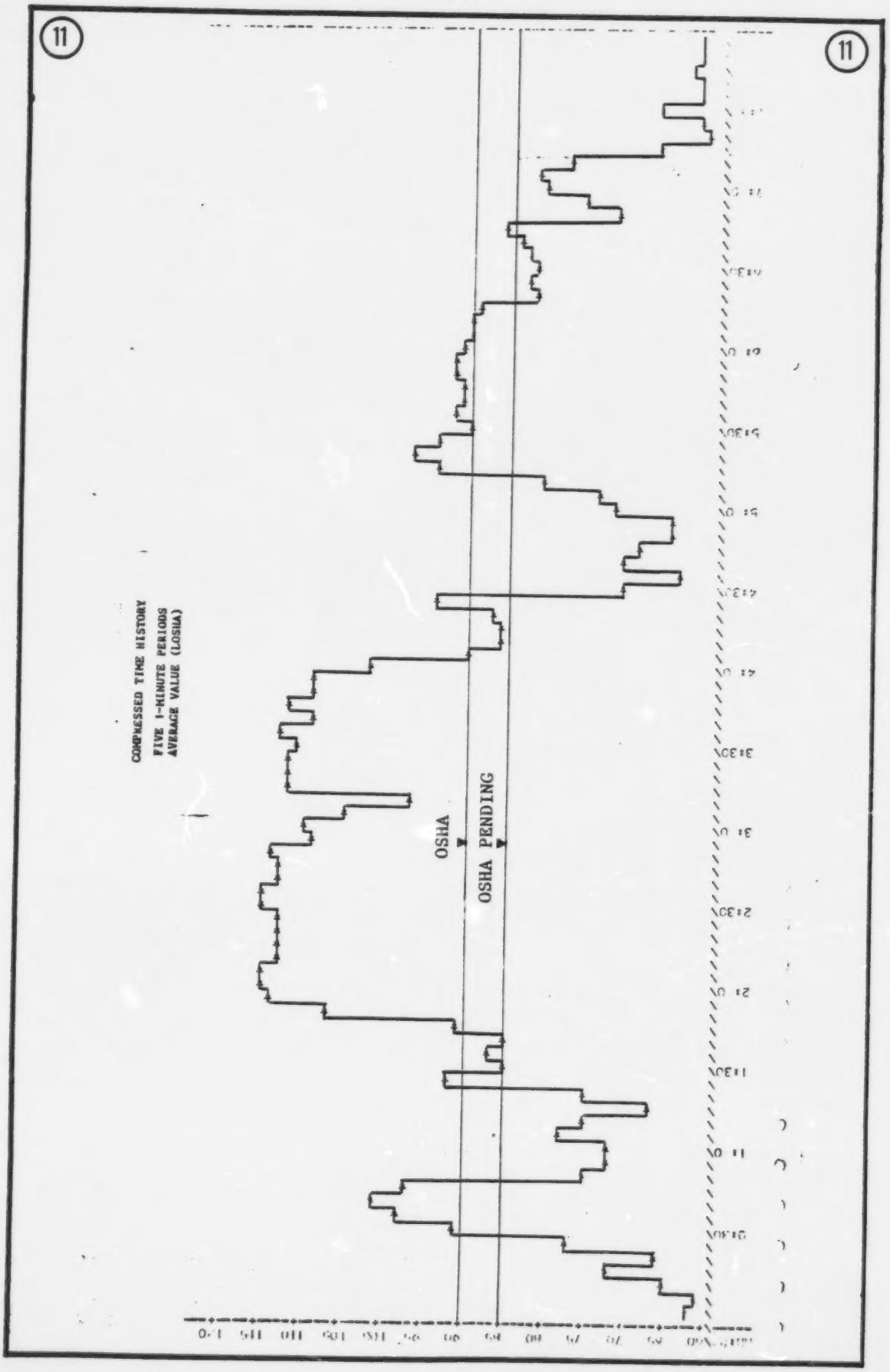
TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	90.1	90.1	12.587	12.59
2	99.3	96.1	45.612	58.20
3	113.4	104.7	328.286	390.48
4	110.3	107.8	207.438	597.92
5	98.9	106.3	10.692	608.62
6	91.1	104.2	14.450	613.07
7	85.7	102.1	4.147	617.22
8	72.4	100.2	1.863	621.08

Min. Conv. = 60 DB — MAX. CONV. = 114.20
ARITHMETIC MEAN = 97.28
GEO. MEAN = 100.2
AVERAGE = 97.28

(11) AMPLITUDE DISTRIBUTION (11)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
64	13.3	60 TO 64
39	8.1	65 TO 69
43	9.0	70 TO 74
22	4.6	75 TO 79
47	9.8	80 TO 84
47	9.8	85 TO 89
69	14.4	90 TO 94
15	3.1	95 TO 99
15	3.1	100 TO 104
16	3.3	105 TO 109
86	17.9	110 TO 114
17	3.5	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




11
11
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(12)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(12)

```
  1  26  80  1220    60    64     4     1
     249     115200  480
 62  60  60  61  60  62  60  60  62  70  64  63  62  61  60  62
 69  70  77  64  60  60  62  60  61  60  64  70  81  60  80  88
 93  91  92  91  91  91  90  90  92  99  98  99  98  98 100  96
 94  95  85  66  61  60  60  60  60  60  60  62  60  62  73  75
 64  90  86  98  98  70  60  60  65  79  85  82  62  60  68  82
 82  83  83  87  88  88  83  84  83  82  87  82  83  83  83  84
 85  87  91  96 104 105 103  83  87  81  83  86  95  80  97  93
 90 100  96 102 101  87  90  95 100 105 106 106 106 104 107 107
108 107 107 102 104 106 107 108 108 106 108 107 103  95  98 105
106 101  83  89  99  89  96 104 106 107 106 105 107 107 107 102
108 110 111 106 104 104 104 106 105  87  90  98 100 102 104 105
104 104 105 103 103 103 103  79  81  81  78  80  86  72  62  83
 83  85  84  95  94  86 100  96 102 104  85  83  83  84  84  84
 84  81  85  80  81  76  60  68  87  97 101 103 104 104 105 105
105 104 105 102 102 102  98 101 106 106 105 107 107 106 105 103
 96 105 107 109 106 107 106 102 106 105 104 100  92 105 104 105
105 105 104 102 102  92  92  87  93 100 105 104 103 103 103 103
101  96 104 104 106 104 103 103  98  96  89  91 106 107 106 106
105  99 105 104 104 104 104 103 104 104 103 100 100  86 101 104
104 104 104 102  93  97  79  61  73  64  60  60  63  70  64  60
 65  97  89  69  60  60  60  60  64  60  61  60  62  65  60  60
 60  60  60  60  61  60  60  77  84 100 102  94  90  92  82  88
 90  91  94  82  83  81  81  81  81  88  84  87  86  93  93  98
 96  95  84  80  78  95  99  87  60  77  83  79  61  60  60  60
 60  79  82  83  83  80  73  74  85  91  69  62  67  84  91  91
 98  85  97  96  94  81  81  81  81  81  81  81  81  81  81  81
 81  82  83  89  84  88  87  88  97 102 102  99 102 103  92  88
 88  90  81  60  60  60  63  60  60  60  60  60  60  60  60  60
 60  60  60  60  61  60  61  61  67  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  76  89
$EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 16/07/79
ENTER SITE CODE (5 CHARS) : CC210

ENTER USER CODE (4 CHARS) : 4227
 ENTER JOB CODE (3 CHARS) : 270
```

```
   DATA LOGGED :16 JULY 1979          DATA ANALYZED : 13 SEPT 1979
       LOGGER : DB-301/26                  SITE CODE : CC210
SERIAL NUMBER : 1220                       JOB CODE : 270
     BASELINE : 60 DB                     USER CODE : 4227
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =  8? ?? ?            STANDBY TIME =  0: 1: 2
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

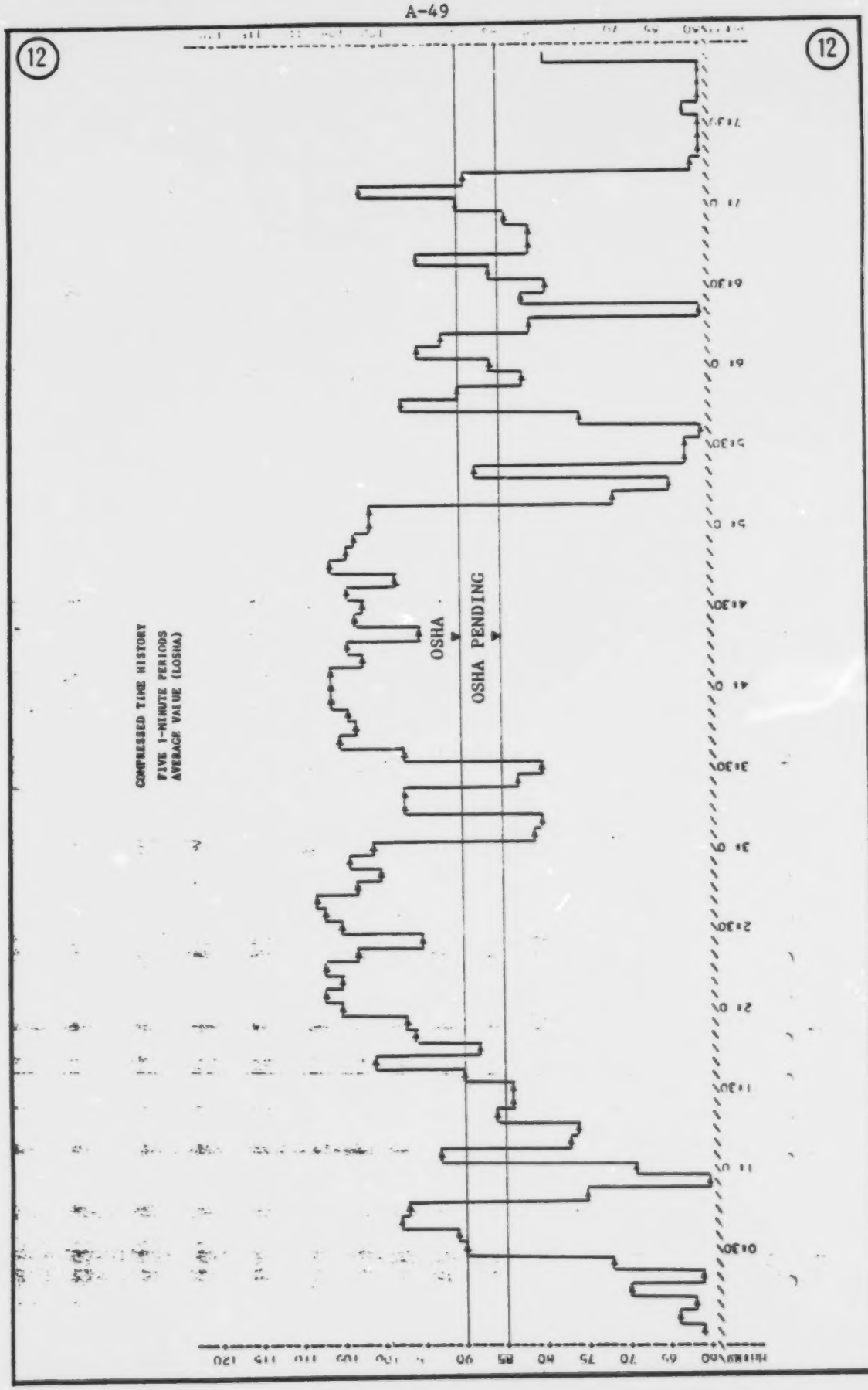
TIME	LOUDNESS		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	87.0	87.0	8.265	8.26
2	91.4	89.5	15.117	23.38
3	104.9	94.5	98.736	122.12
4	99.2	95.7	44.728	166.85
5	103.4	99.9	79.947	246.79
6	91.3	99.0	14.878	261.67
7	87.4	98.1	8.662	270.33
8	86.4	97.4	7.600	277.93

```
MIN. COMP. =  60 DB                MAX. COMP. = 111 DB
ARITHMETIC MEAN =  85 DB
STD. DEVIATION =  17 DB
VARIANCE =289 DB
```

(12) AMPLITUDE DISTRIBUTION (12)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
114	23.8	60 TO 64
13	2.7	65 TO 69
10	2.1	70 TO 74
12	2.5	75 TO 79
69	14.4	80 TO 84
40	8.3	85 TO 89
37	7.7	90 TO 94
40	8.3	95 TO 99
78	16.3	100 TO 104
65	13.5	105 TO 109
2	.4	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


12
12
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0130
1130
2130
3130
4130
5130
6130
7130
60
65
70
75
80
85
90
95
100
105
110
115
120

(13)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(13)

```
  1  26  80  1226    60    64     4     1
     343      115200  480
 61  60  62  60  61  60  60  60  71  64  60  60  64  60  60  71
 72  69  61  60  60  62  62  61  60  62  72  80  60  78  88  92
 92  91  90  90  90  90  90  91  99  98  98  98  97 100  97  95
 94  88  61  60  60  60  60  60  60  60  60  60  60  66  88  92
 93  97 103 105  95  76  74  60  60  60  60  60  81  50  60  60
 86  91 101 102 103 111 114 116 116 116 116 116 116 116 113  99
106 113  [illegible]  89  89  89  89  88  90 111 114 117 116 116 116 116
115 115 113 113 112 102 109 114 116 116 115 115 115 115 115 115
112 113 108 111 114 114 113 113 114 114 114 112  93  92  91  89
 89 107  87  85  88  91  91  93  92  91  91  79  91  91  89  89
 89  90  84  87  87  90  86  81  71  90  93  92  89  81  60  60
 60  60  60  60  60  60  60  60  60  60  68  72  61  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  61  63  66  65  61  67  71  80  88  86  88
 88  88  89  90  90  77  66  82  69  61  77  82  86  85  84  79
 60  60  60  60  60  60  60  46  50  60  94  96  95  89  64  61
 64  66  70  62  61  74  63  61  60  60  60  65  60  61  55  62
 62  66  70  64  61  61  60  67  61  63  64  62  89  93  87  89
 90  90  89  88  87  88  93  96  94  97 100  91  73  61  60  78
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  61  65  65  64  64  73  60  64  78  80  84
 84  83  83  60  83  85  84  83  83  69  72  74  78  64  84  86
 87  89  88  88  87  71  83  74  82  64  60  82  69  84  86  87
 89  90  90  90  89  90  89  86  85  60  60  60  60  60  79  84
 83  92  76  83  83  81  82  67  60  60  60  68  60  79  82  82
 90  92  84  89  90  90  89  87  88  89  90  90  92  91  97  88
 88  76  74  71  73  81  71  76  99 100  87  60  60  63  72  60
 66  72  73  71  70  74  70  61  65  61  60  72  60  60  68  60
 69  60  60  62  60  62  65  65  64  69  90  95  97 101  98  97
%EOF
```

ENTER LOG DATE (DD/MM/YR) : 16/07/79
ENTER SITE CODE (5 CHARS) : CC210

ENTER USER CODE (4 CHARS) : 4296
ENTER JOB CODE (3 CHARS) : 281

DATA LOGGED :16 JULY 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1226
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

DATA ANALYZED : 13 SEPT 1979
SITE CODE : CC210
JOB CODE : 281
USER CODE : 4296
THRESHOLD : [illegible]
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

OCCUPATIONAL EXPOSURE LEVEL (O.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING
[illegible]
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

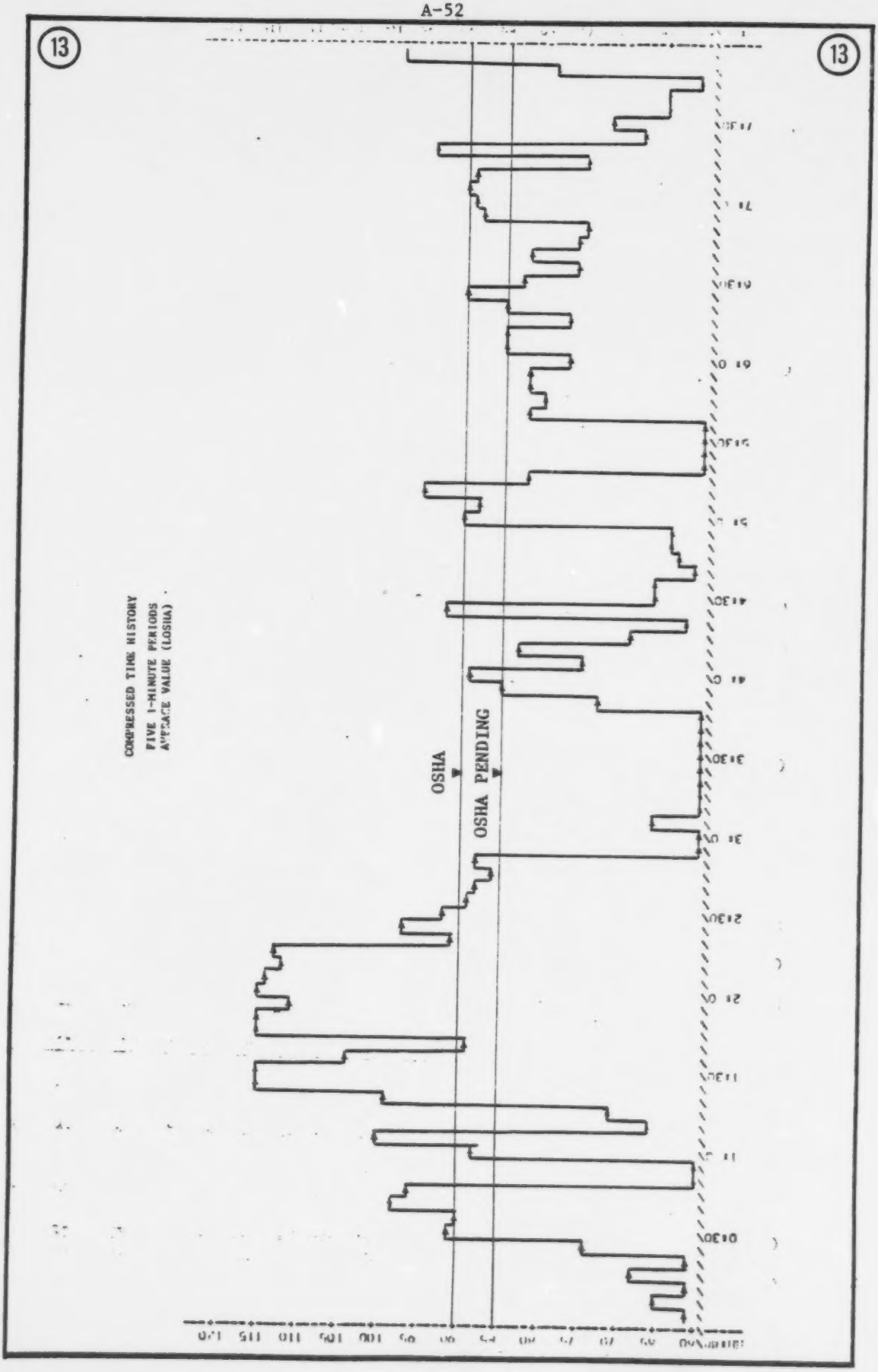
TIME	LEVELS		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.8	86.8	8.004	8.00
2	104.9	104.2	172.053	180.06
3	106.5	105.1	123.087	303.14
4	99.4	103.0	.830	303.97
5	80.1	101.5	3.156	307.13
6	84.4	100.3	5.719	312.85
7	93.3	99.3	4.967	317.82
8	87.1	98.5	8.321	326.14

MIN. COMP. = 60 DB MAX. COMP. = 117 DB
ARITHMETIC MEAN = 76 DB
STD. DEVIATION = 14 DB
VARIANCE =324 DB

(13) AMPLITUDE DISTRIBUTION (13)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
182	37.9	60 TO 64
25	5.2	65 TO 69
29	6.0	70 TO 74
14	2.9	75 TO 79
39	8.1	80 TO 84
63	13.1	85 TO 89
52	10.8	90 TO 94
19	4.0	95 TO 99
9	1.9	100 TO 104
5	1.0	105 TO 109
21	4.4	110 TO 114
22	4.6	115 TO 119

TOTAL NO. OF DATA POINTS = 480


13
13
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
A-WEIGHTED SOUND LEVEL (LOSHA)
OSHA
OSHA PENDING

(14)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

  1  26  80  1216    60    64     4     1
     105     115200  480
 69  81  80  82  80  80  82  83  81  80  80  83  79  79  87  85
 92  90  94  93  94  94  97 101  98  98  95  95  97  95  98  89
 73  70  81  85  84  80  80  80  85  80  80  83  83  80  83  95
 99 105  87  88  89  96 105  83  84  90  95  91  88  86  80  80
 76  80  74  79  81  81  81  80  85  98  95  95  96  95  95  95
 94  80  90  80  94  97  97  95  94  97  90  92  89  93  90  90
 99  92 100  94  94  94  97  95  90  93  91  92  92  92  92  92
 83  84  83  82  89  81  97  89  90  89  90  91  85  93  93  92
 92  91  93  91  92  93  90  91  93  89  89  92   5  99 105 101
 92  92  95  90  92  92  94  92  96  99  96  93  94  96 103 110
110 111 111 113 112 112 112 112 111 110 109 109 110 110 110 110
110 106 113 112 113 114 113 111 112 113 112 112 111 113 113 112
111 113 113  90 105 113 112 113 113 113 113 113 113 113 110 112
101 110 112 113 113 113 108  98 101  99  95  93  90  89  98  93
 74  85  75  85  83  89  93  94  94  92  91  90  89  84  75  75
 83  82  81  81  70  79  90  90  90  90  96 103 100 101 100  93
 92  92  91  94  77  82  80  80  80  83  89  85  81  81  85  80
 84  74  83  80  81  83  84  86  80  80  80  81  86  90  93  94
 92  91  93  96 101 103 102 101 101  95  80  80  80  80  80  80
 80  80  80  80  80  80  80  91  85  80  80  80  80  80  80  80
 80  82  86  85  88  88  84  84  85  86  85  85  87  85  86  87
 85  84  86  85  86  87  90 100 104 102  98  99 100 105 106 104
108 108 108 107 107 107 107 107 108 108 108 106 109 100 105 111
111 112 112 112 112 112 112 111 111 111 112 112 111 108 102 103
100 108 112 113 113 113 113 113 112 113 112 111 106 111 104 113
112 114 114 111 110 115 114 114 114 114 114 114 114 115 111 101
 95  96 108 110 113 113 115 114 114 115 114 112 113 114 115 115
115 114 111 111 112 112 108 109 112 113 112 112 112 112 112 112
112 110 110 108  96 106  98  75  61  71  61  62  60  59  70  78
 88  92  93  96 102 100  84 100  99  94  96  93  85  88  93 100
%EOF

ENTER LOG DATE (DD/MM/YR) : 17/07/79

ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4296

 ENTER JOB CODE (3 CHARS) : 291

   DATA LOGGED :17 JULY 1979                DATA ANALYZED : 13 SEPT 1979
        LOGGER : cdc-301/26                      SITE CODE : CC210
SERIAL NUMBER : 1216                             JOB CODE : 291
      BASELINE : 60 DB                         USER CODE : 4296
 DATA IC RANGE : 50 DB                         THRESHOLD : 85 DB
SAMPLING RATE : 4/SEC                     TOTAL SAMPLES = 115200
TEST DURATION = 480 MINUTES               ANALYSIS TIME = 8 HRS

              TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOTAL DOSE = 20.00 / 480 MIN
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 85 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

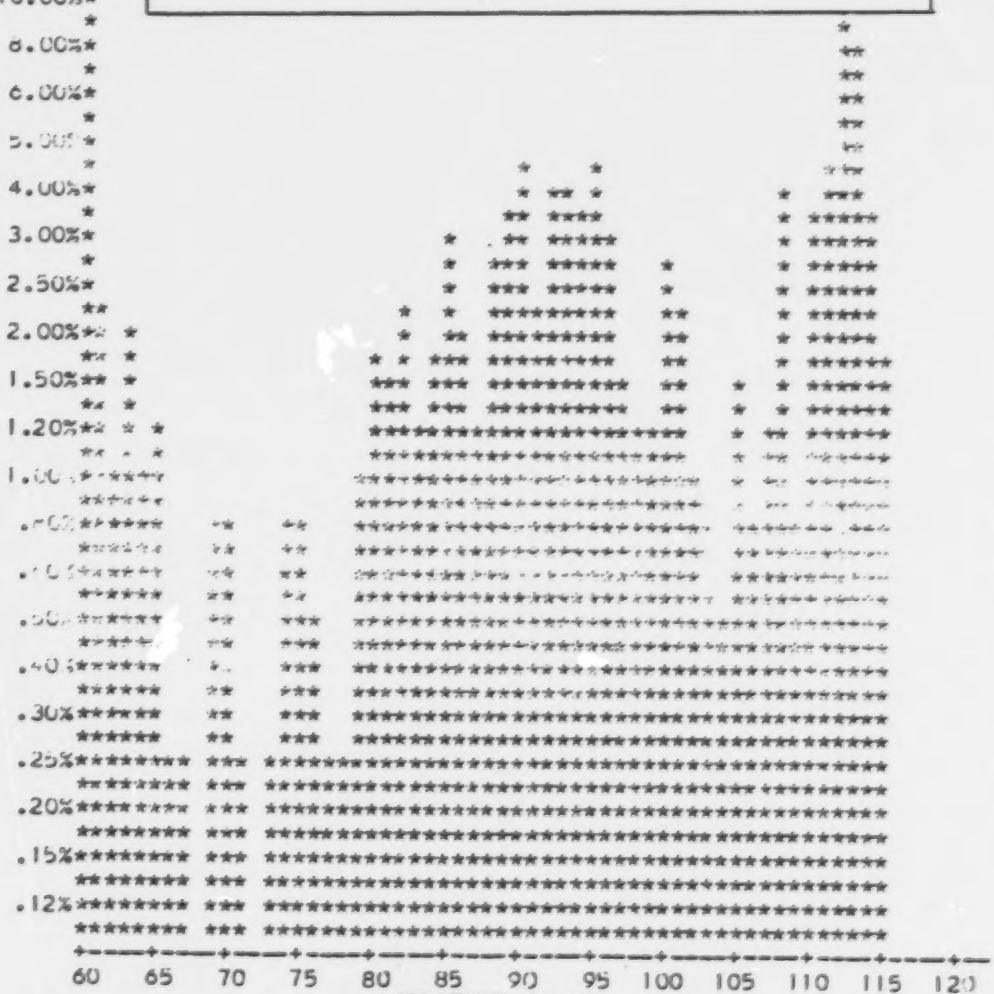
TIME          LEVEL                    DOSE
HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1       90.8       90.8         13.996       14.00
   2       90.8       90.8         13.063       27.96
   3       [illegible]  [illegible]  [illegible]  117.09
   4       [illegible]  109.3        156.901      273.99
   5       91.4       101.0         15.125       289.07
   6       96.8       100.5         32.160       321.23
   7       111.0      103.3        230.160       551.40
   8       104.6      104.2        163.734       715.14
MIN. COMP. =  60 DB                MAX. COMP. = 115 DB
ARITHMETIC MEAN =  92 DB
STD. DEVIATION =  17 DB
VARIANCE =289 DB
```

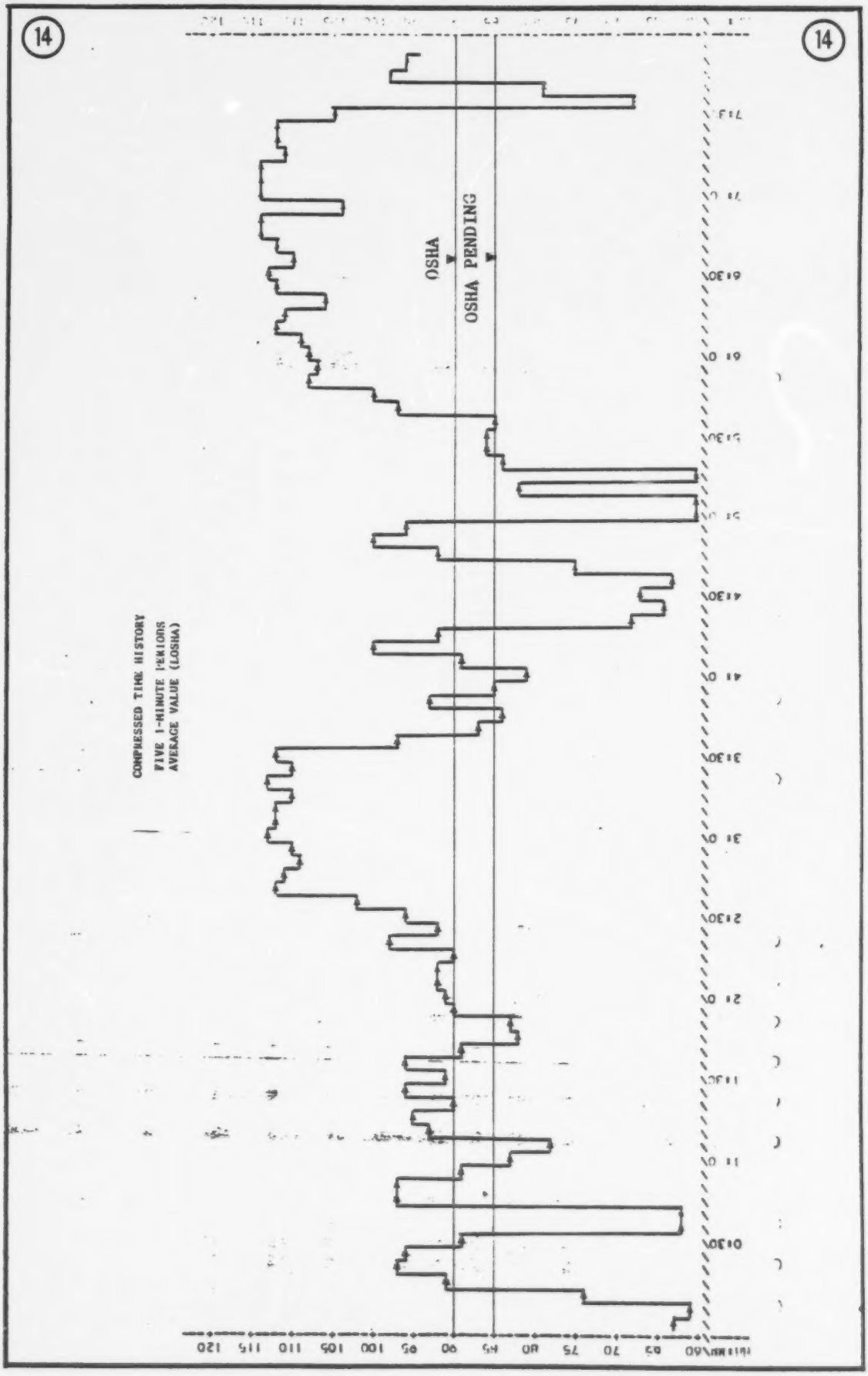
(14)

14

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
67	14.0	60 TO 64
10	2.1	65 TO 69
8	1.7	70 TO 74
11	2.3	75 TO 79
34	7.1	80 TO 84
50	10.4	85 TO 89
73	15.2	90 TO 94
45	9.4	95 TO 99
30	6.3	100 TO 104
33	6.9	105 TO 109
112	23.3	110 TO 114
7	1.5	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




14
14
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
dBA
60
65
70
75
80
85
90
95
100
105
110
115
120

(15)

```
 PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
   1  26  80  121H   60   64    4    1
      120     115200  480
  64  60  60  60  60  60  62  60  62  60  63  78  79  85  93  90
  91  93  92  92  92  97 101  97  97  94  95  97  94  97  90  71
  71  61  62  63  60  62  60  60  60  61  61  60  61  62  66  68
  66  61  61  64  66  94  95  95  95  99  94  88  90  82  82  78
  83  78  82  82  82  82  82  95  99  97  96  96  97  97  97  97
  82  82  82  96  94  98  97  96  97  91  89  91  96  93  91  92
  97  94  92  98  86  86  86  87  88  85  86  84  84  80  85  84
  85  86  85  86  83  90  90  88  89  89  95  90  90  91  88  90
  90  88  88  91  95  95  90  92  91  88  87  88   5  96  89  88
  88  88  92  88  89  92  91  90  94  94  93  92  92 103 113 113
 115 118 114 117 117 115 116 116 111 101 114 112 112 112 112 112
 111 112 115 117 114 119 115 117 118 117 116 115 115 115 116 115
 117 117  98 107 115 114 116 116 117 116 116 116 116 114 110 105
 114 116 112 115 116 112  92 105 114 114 113 114 115 115 115 114
 115 114 114 114 113 107 112 107 105 108 109 109  96  92  94  95
  97  94  93  95  93 100 108 107 108 109 109 113 112 111 111 110
 110 112  92 106 111 108 111 111 110 111 108 109 112 112 105 104
 112 113 114 113 114 108 108 110 109 108 109 109 102  94  91  95
  89  86  87  91  87  87  95  90  84  93  98  99  94  93  91  97
  69  63  61  66  69  60  60  60  60  60  60  60  60  60  63  68
  60  66  60  63  60  63  60  60  60  60  86  94  99  99  93  92
  91  86  78  85  86  87  99 104 101  87  87  98 105 108 111 106
 105 105 105 105 105 104 105 109 113 106 106 106 103 104 109 113
 110 110 109 109 109 109 109 109 109 109 109 109 108 106 108 103
 118 117 117 116 115 114 114 114 115 115 113 108 113 105 115 115
 118 116 113 111 117 116 116 117 116 116 116 117 117 114 104  96
  97 111 113 116 116 117 116 116 117 117 116 116 117 117 117 117
 117 113 113 114 115 111 113 115 117 117 117 117 114 100  98  99
  97  96  95  96 105  99  66  60  60  60  63  60  66  64  68  93
  91  91  95 102 101  89  99 101  97  97  96  82  90  93 102 103
$EOF
```

(15)

```
ENTER LOG DATE (DD/MM/YR) : 17/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4227
 ENTER JOB CODE (3 CHARS) : 270
```

```
   DATA LOGGED :17 JULY 1979          DATA ANALYZED : 14 SEPT 1979
        LOGGER : DS-301/26                 SITE CODE : CC210
 SERIAL NUMBER : 1214                       JOB CODE : 270
      BASELINE : 60 DB                     USER CODE : 4227
 DYNAMIC RANGE : 54 DB                     THRESHOLD : 40 DB
  SAMPLING RATE : 4/SEC                  TOTAL SAMPLES = 115200
  TEST DURATION = 8H 0M 0S                STARTED TIME = 08:08:30
```

TIME HISTORY ANALYSIS

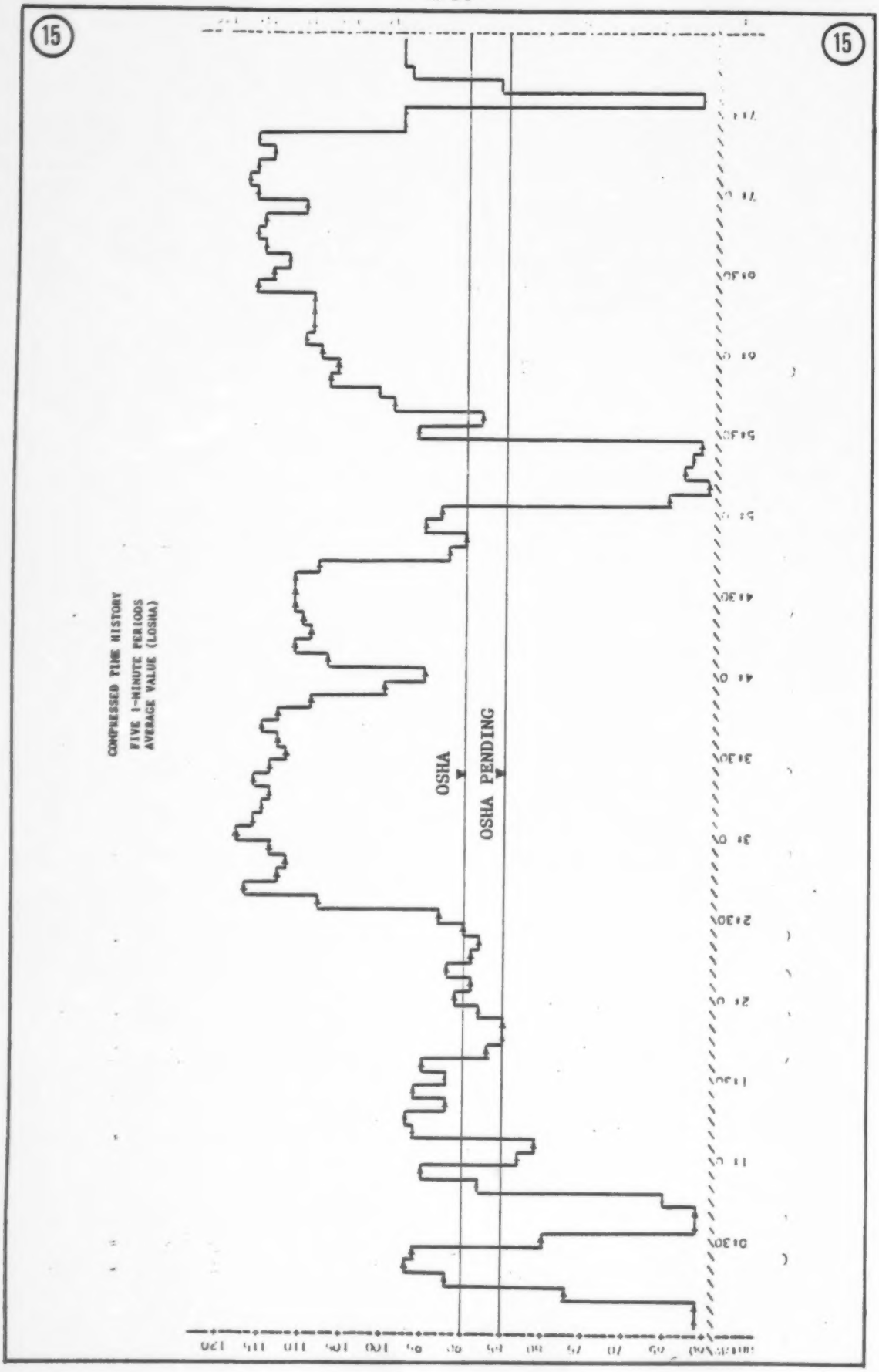
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOG RATE = 10 DB / 1 DPS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		LOGE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	88.3	88.3	9.840	9.84
2	91.5	90.1	15.410	25.25
3	107.6	100.8	142.555	167.82
4	113.8	104.7	337.075	504.89
5	107.2	104.8	136.529	641.42
6	97.0	103.8	33.204	674.62
7	112.5	104.3	283.973	958.60
8	110.1	104.7	203.998	1162.59

MIN. COMP. = 60 DB MAX. COMP. = 119 DB
ARITHMETIC MEAN = 96 DB
STD. DEVIATION = 14 DB
VARIANCE =324 DB

15 AMPLITUDE DISTRIBUTION 15

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
55	11.5	60 TO 64
13	2.7	65 TO 69
2	.4	70 TO 74
5	1.0	75 TO 79
17	3.5	80 TO 84
45	9.4	85 TO 89
63	13.1	90 TO 94
59	12.3	95 TO 99
19	4.0	100 TO 104
55	11.5	105 TO 109
68	14.2	110 TO 114
79	16.5	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


15
15
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(16)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
1 20 60 1224 60 64 4 1
11 1152 0 480

60	67	62	61	68	66	65	64	61	61	68	61	60	60	63	64
60	61	60	67	60	61	62	60	60	70	68	68	76	73	60	72
67	62	63	76	100	99	99	100	99	96	94	97	87	75	71	69
63	60	60	60	60	60	60	60	61	66	60	74	87	89	91	86
86	87	91	88	93	99	111	119	119	120	119	119	115	115	117	115
116	116	116	116	117	117	117	117	117	117	113	113	113	113	117	117
117	117	117	113	101	99	91	92	87	98	93	97	93	93	84	84
85	88	88	96	97	97	89	91	91	99	100	101	102	103	97	93
100	96	101	98	99	95	96	94	94	99	94	93	95	99	101	97
99	99	97	97	97	96	96	97	95	97	97	97	97	97	97	97
95	96	95	97	94	95	95	95	98	98	94	93	93	93	93	91
92	93	93	93	93	93	93	97	96	95	95	92	93	93	93	93
98	100	99	94	93	93	93	94	99	99	98	98	98	98	99	100
93	83	93	91	93	93	100	103	102	95	106	114	116	117	117	117
117	118	119	117	116	107	114	97	117	119	119	119	119	117	116	116
100	97	97	97	99	96	101	117	120	97	99	100	116	116	120	117
98	99	99	98	98	98	98	98	98	98	98	98	98	98	99	99
99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
116	120	120	120	120	120	119	116	120	121	121	120	117	119	120	120	121
120	120	120	120	120	119	116	120	120	119	116	116	120	120	120	120
98	98	98	98	98	98	98	99	98	98	98	98	98	107	117	119
119	118	118	118	119	119	119	118	118	116	118	118	118	118	118	119
119	120	119	118	117	120	120	119	120	116	120	121	121	120	120	121
121	121	121	120	121	121	121	121	120	119	116	120	117	119	119	120
121	121	121	120	116	118	116	119	119	121	121	121	121	121	121	121
121	114	108	109	106	111	116	115	119	120	107	103	103	103	101	120
121	121	120	120	122	119	119	119	119	121	119	119	118	116	113	102
95	94	74	61	60	67	60	64	61	60	63	60	61	60	60	60
61	61	60	63	61	62	65	78	89	89	89	89	88	88	88	88

EOF

ENTER LOG DATE (DD/MM/YR) : 20/07/79

ENTER SITE CODE (5 CHARS) : 25205
ENTER USER CODE (4 CHARS) : 7786
ENTER JOB CODE (3 CHARS) : 272

DATA LOGGED :20 JULY 1979
LOGGER : [illegible]-301/25
SERIAL NUMBER : 1224
BASELINE : [illegible] DB
DYNAMIC RANGE : [illegible] DB
SAMPLING RATE : [illegible]/SEC
TEST DURATION = [illegible] ([illegible])

DATA ANALYZED : 14 SEPT 1979
SITE CODE : 25205
JOB CODE : 272
USER CODE : 7786
INCREMENT : [illegible]
TOTAL SAMPLES = 1152 0
DURATION OF [illegible] = [illegible]

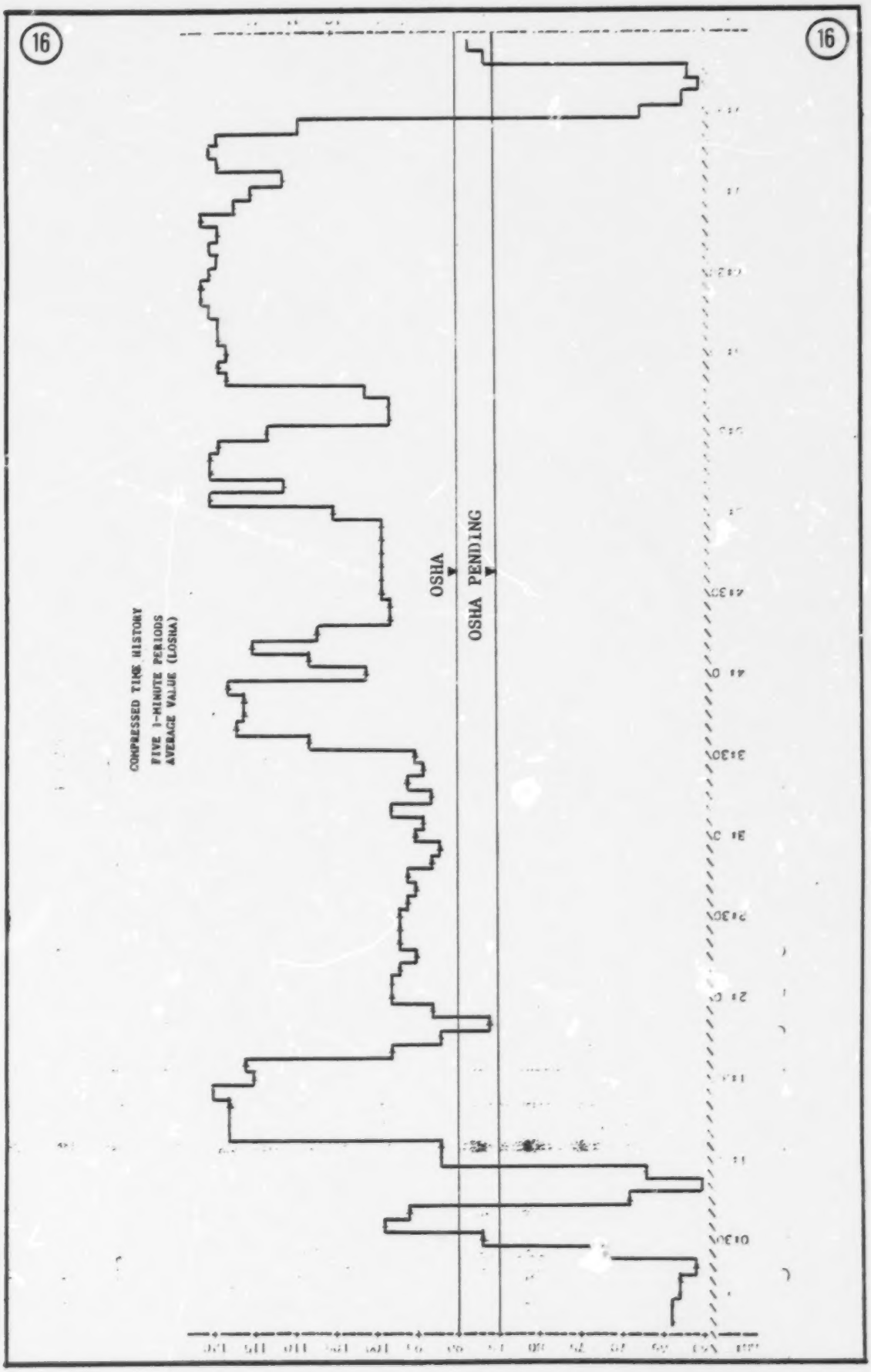
TIME HISTORY ANALYSIS

NOISE EXPOSURE LEVEL (L.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL TIME = [illegible] / [illegible]
UNWEIGHTED (TOTAL) SPL = [illegible]
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.9	85.9	7.096	7.10
2	112.[illegible]	10[illegible].0	204.[illegible]	303.[illegible]
3	[illegible]5.3	105.[illegible]	29[illegible].33	33[illegible].21
4	102.[illegible]	1[illegible]7.0	19[illegible].437	527.69
5	104.1	106.5	[illegible]7.[illegible]20	[illegible]16.36
6	110.5	107.0	426.[illegible]33	1043.29
7	110.5	111.6	743.[illegible]2	1787.13
8	111.6	111.7	231.337	2018.47

MIN. COMP. = 60 DB MAX. COMP. = 122 DB
MEAN SPEC PEAK = [illegible] DB
STD. DEVIATION = 18 DB
VARIANCE =324 DB

FREQUENCY DISTRIBUTION			
	FREQUENCY		GROUP
	NUMBER	PER CENT	
	48	11.4	60 TO 64
	12	2.9	65 TO 69
	6	1.4	70 TO 74
	3	.7	75 TO 79
	3	.7	80 TO 84
	25	6.0	85 TO 89
	49	11.7	90 TO 94
	131	31.2	95 TO 99
	24	5.7	100 TO 104
	11	2.6	105 TO 109
	11	2.6	110 TO 114
	157	32.7	115 TO 119
TOTAL NO. OF DATA POINTS = 480			


16
16
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(17)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1220   60   64    4    1
     102     115200  400
 63  62  68  69  72  72  77  71  75  74  76  66  61  64  64  65
 63  67  63  62  66  63  66  68  61  68  60  67  66  73  82  76
 74  86  88  89  92  98  99  99  99  99  98  98  99  90  86  73
 62  54  60  60  60  60  60  60  60  60  61  62  63  71  71  77
 87 100  99  97  89  86  69  74  73  68  72  65  75  96  89  87
 82  82  85  87  81  80  83  80  89  92  87  87  87  86  86  92
 92  92 104 105 112 114 114 114 115 112 111 111 111 106 105 115
112 111 111 111 111 110 111 110 107  99  94 110 112 112 112 111
112 111 102  94  90  96 111 113 112 112 112 113 112 111 102 105
112 113 112 112 112 112 112 112 111 108 104  95  83  82  83  84
 84  94  95  90  89  84  94  96  92  97  93  95  96  96  96 101
 99  96  83  93  95 100  92 100 100  93  97  95  98  94  91  90
 95  96 101  99  86  77  82  93  89  85  91  84  82  89  82  83
 73  76  79  76  84  87  86  87  90  90  87  87  85  90  87  87
 86  86  86  85  86  86  87  86  90  88  87  87  87  86  86  87
 86  87  94  90  79  74  71  86  86  89  83  78  75  71  76  85
 89  90  81  70  77  80  87  86  90  90  90  71  80  85  86  83
 74  70  61  63  60  63  60  63  60  60  61  63  60  60  60  60
 60  60  60  60  62  60  60  60  60  60  60  60  60  57  62  64  62
 79  72  83  92  88  80  80  80  70  85  93  94  90  88  88  85
 92 100 114 114 115 116 116 116 116 115 115 114 113 103 112 112
115 114 114 113 113 114 113 113 112 102  98 105 112 114 114 114
116 116 116 115 115 109 114 114 114 114 108  91  92  92  89  91
 99 107 114 116 117 117 116 115 115 116 116 115 114 115 115 116
115 114 116 116 115 116 116 116 116 114 109 111 115 116 116 115
116 117 115 112 115 114 114 111 108  97 103  99 106 112 115 116
115 114 113 113 111 110  99 104 104 107 104  90 103 114 111 111
115 115 115 112 111 112 112 112 109 105  87  83  78  82  95 106
 98  88  80  68  61  72  76  74  67  63  62  75  70  60  68  63
 65  69  67  64  80  70  60  65  77  94  97  96  92  90  90  89
$EOF
```

(17)

ENTER LOG DATE (DD/MM/YR) : 20/07/79

ENTER SITE CODE (5 CHARS) : 24055
ENTER USER CODE (4 CHARS) : 2371

ENTER JOB CODE (3 CHARS) : 291

DATA LOGGED :20 JULY 1979
LOGGER : [illegible]
SERIAL NUMBER : 1220
BASELINE : [illegible]
DYNAMIC RANGE : [illegible]
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

DATA ANALYZED : 17 SEPT 1979
SITE CODE : 24055
JOB CODE : 291
USER CODE : 2371
THRESHOLD : [illegible]
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

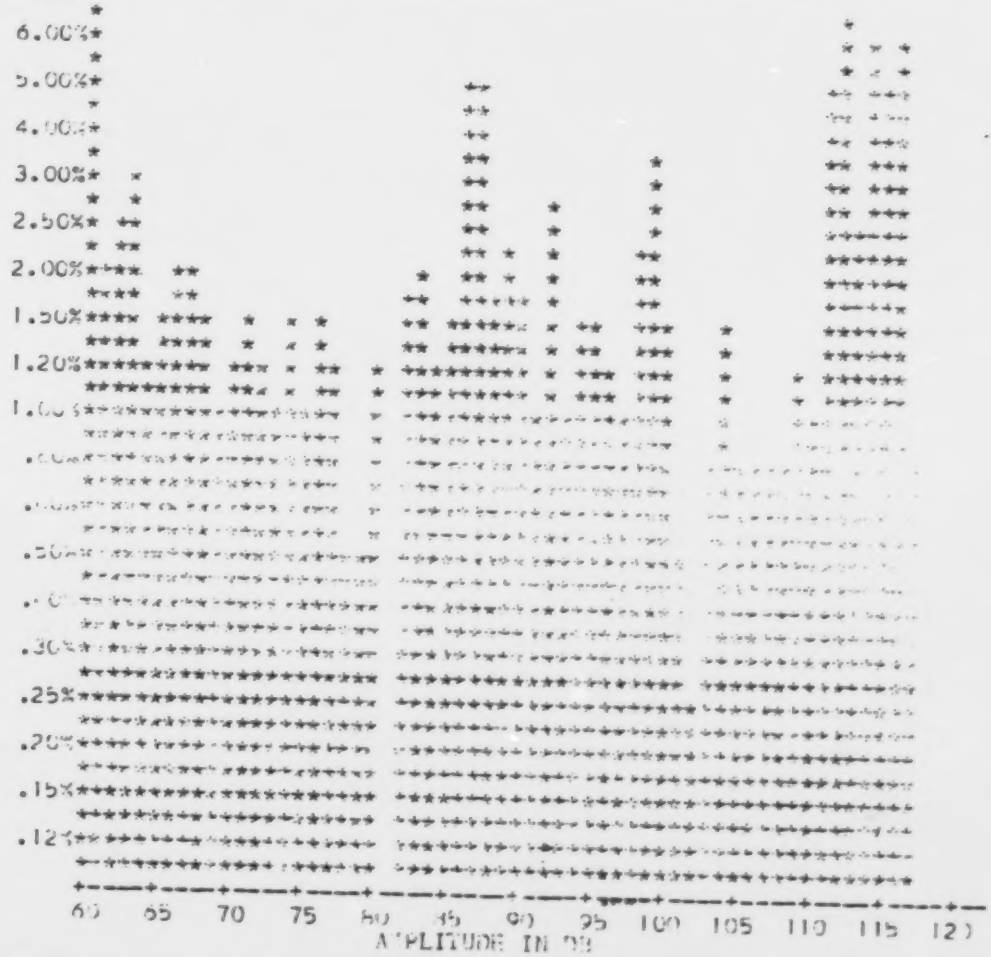
NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TIME INC = 60 S / P [illegible]
CALCULATE (CUMULATIVE) TABLE = [illegible]
THRESHOLD (Cutoff) LEVEL = [illegible]
NUMBER OF COMPUTATIONS = 400
PERIOD = 1 HOURS

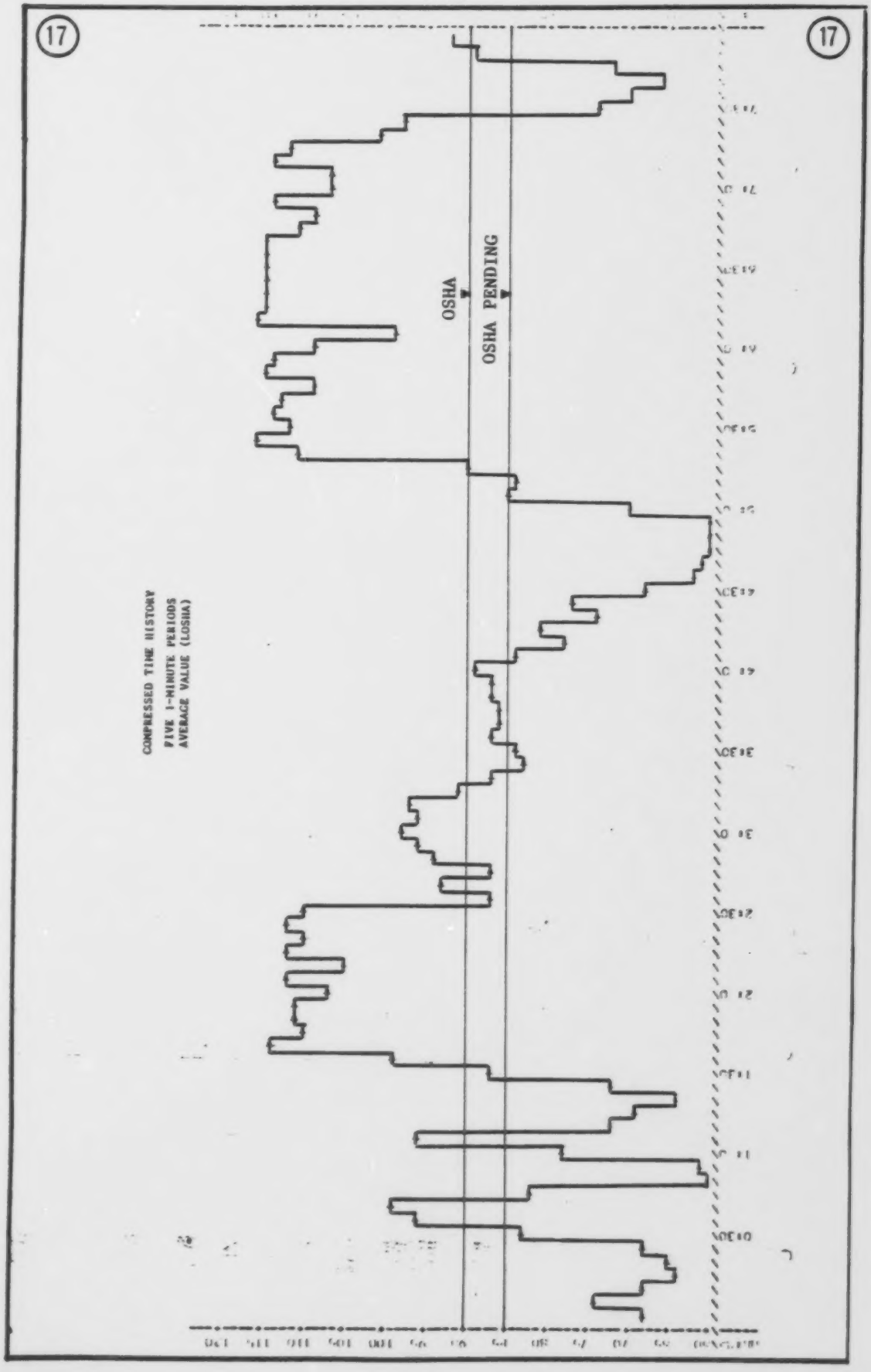
TIME	LOGA		LOGE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.9	85.9	7.096	7.10
2	104.3	99.8	90.609	97.70
3	100.7	102.4	126.825	224.52
4	90.8	101.3	14.034	238.62
5	77.6	99.7	2.255	240.88
6	110.4	103.0	212.049	452.93
7	113.5	105.7	323.261	776.19
8	103.9	105.5	81.425	857.61

MIN. CONF. = 60 DB
ARITHMETIC MEAN = 99 DB
STD. DEVIATION = 12 DB
VARIANCE =151 DB
MAX. CONF. = 117 DB

(17) AMPLITUDE DISTRIBUTION (17)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
75	15.6	60 TO 64
32	6.7	65 TO 69
26	5.4	70 TO 74
19	4.0	75 TO 79
26	5.4	80 TO 84
63	13.1	85 TO 89
32	6.7	90 TO 94
38	7.9	95 TO 99
20	4.2	100 TO 104
16	3.3	105 TO 109
84	17.5	110 TO 114
49	10.2	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




17
17
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(18)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

  1  26  80  1220    60    64     4     1
     71      115200  480
 66  60  60  60  60  60  60  68  60  60  60  60  60  60  62
 64  66  62  76  63  63  68  60  60  66  60  65  75  68  62  60
 71  67  70  60  65  69  91  83  83  81  78  88  86  85  91  85
 85  82  92  94  95  95  85  93  89  95  97  94  95  91  94  92
 81  61  62  60  60  60  60  60  60  60  60  70  60  69  69  60
 60  92 100  91  90  92  85  95  97  99  96  89  94 101 111 111
111 112 109 111 112 111 111 110 110 109 109 105 110 106 105 104
105 109 103 108 106 103  91  94  97  88  90  89  86  87  85  85
 89  91  90  90  85  88  86  85  90  90  88  90  89  88  89  86
 85  85  95  96  89  95  98  87  87  97  88  88  97  93  93  90
 99  89  96  89  95  89  89 100  95  89 102 110 111 104  97  95
 93  86 114 113 115 114 108 110 112 110 112 114 114 114 108 110
109 108 105 103 110 110 110 109 110 113 113 112 111 110 105 111
112 112 110 108 110 113 112 108 106 104 102  96  87  97  97  96
 94  90  87  86  93  90  97  94  89  90  89  91  94  90  98  91
 91  90  89  87  88  90  92  92  90  94  89  96  97  91  90  88
 89  96  91 101  89  88  84  60  60  60  60  66  60  60  60  60
 60  60  70  62  60  61  60  60  60  62  62  61  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  61  60  60  61  60  60  60  60
 60  60  60  60  62  60  60  60  60  60  60  66  60  60  60  60  60
 98  88  88 106 107  98 105 109 108 106  97 102  96  88  86  87
 88  87  88  89  89  91  86  87 102 107 108 107 105 103  98 105
103 102 102 100  98 102 106 108 105 103 102 100  97 106 109 109
108 108 110 108 108 109 108 109 109 107 106 104 102  91  91  88
 94  94  86  90  90  87  95  95  94  94  92  92  83  87  96  91
 96  98  91  64  71  92  96  98  99  97  98  97  77  63  85  94
%EOF


ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 35950

ENTER USER CODE (4 CHARS) : 7653

 ENTER JOB CODE (3 CHARS) : JDO
```

```
    DATA LOGGED :14  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : 08-301/26                 SITE CODE : 35950
SERIAL NUMBER : 1220                       JOB CODE : JDO
      BASELINE : 60 DB                     USER CODE : 7653
DYNAMIC RANGE : 64 DB                      THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 01: 0             STANDBY TIME =   01 0817

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

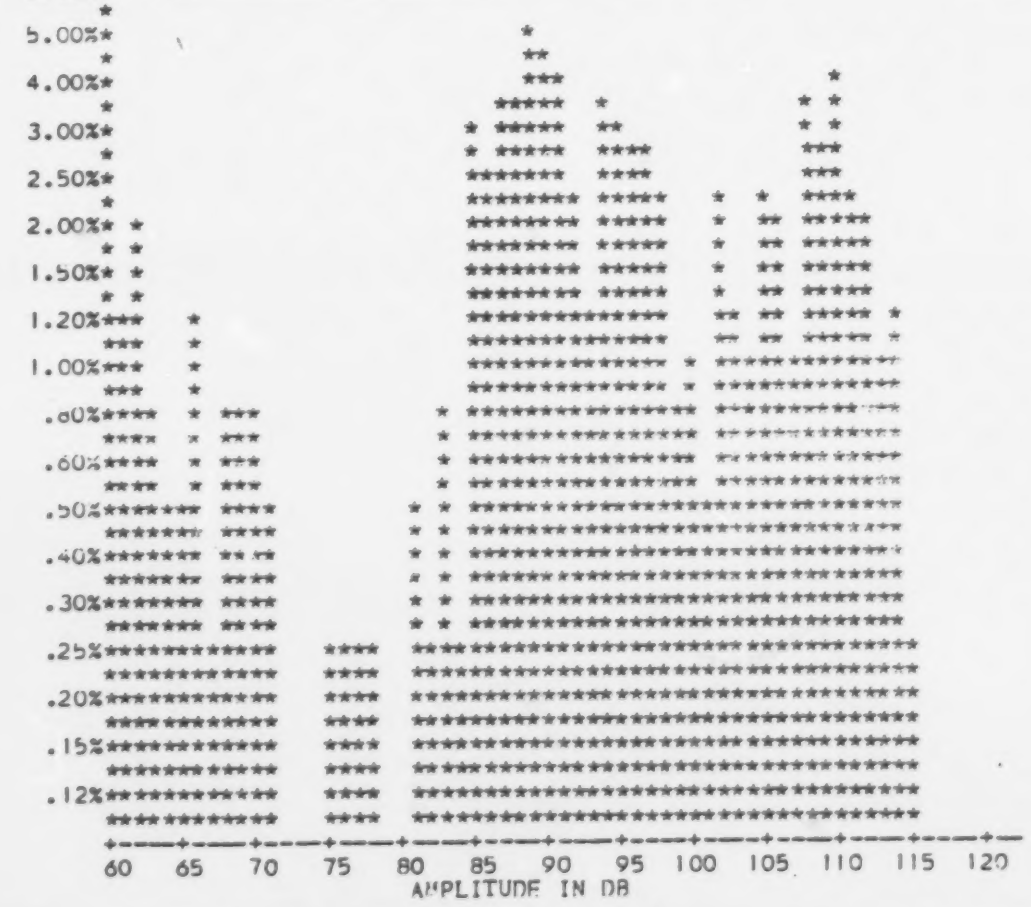
TIME          LOSHA                        NOISE
HOUR     CURRENT  CUMULATIVE        CURRENT   CUMULATIVE
   1       83.5       83.5          5.052        5.05
   2      103.2       94.6         17.434       22.49
   3       97.3       94.2         34.470       117.16
   4      107.7      102.0        144.215       263.37
   5       95.3      100.6          6.494       269.87
   6       60.0       99.2           .195       270.06
   7       97.7       99.0         36.189       306.25
   8      101.5       99.4         61.433       367.68
MIN. COMP. =  60 DB                MAX. COMP. = 115 DB
ARITHMETIC MEAN =  83 DB
STD. DEVIATION =  19 DB
VARIANCE =361 DB
```

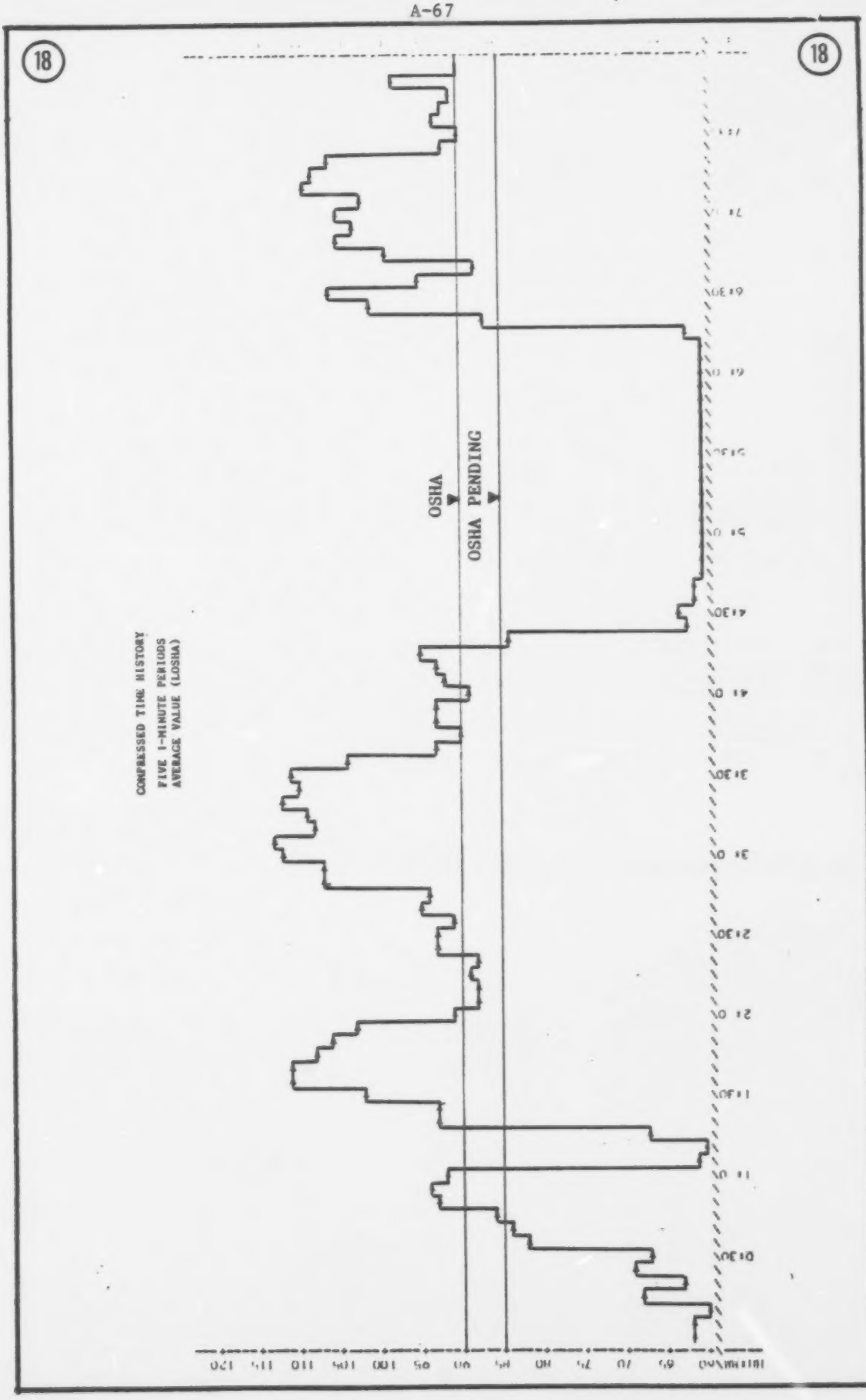
AMPLITUDE DISTRIBUTION

(18) (18)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
157	32.7	60 TO 64
14	2.9	65 TO 69
5	1.0	70 TO 74
4	.8	75 TO 79
7	1.5	80 TO 84
71	14.8	85 TO 89
62	12.9	90 TO 94
46	9.6	95 TO 99
24	5.0	100 TO 104
47	9.8	105 TO 109
42	8.8	110 TO 114
1	.2	115 TO 119

TOTAL NO. OF DATA POINTS = 480




18
18
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(19)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1220    60    64     4     1
     655      115200   480
  65  60  64  61  63  60  60  60  60  66  60  66  66  62  65  64
  73  62  64  61  72  85  80  90  91  90  88  92  98  93  97  90
  91  94  94  93  93  98  90  87  82  88  92  86  93  93  90  88
  60  62  68  66  65  60  60  60  60  60  66  64  65  67  63  76
  97  95  94  93  95  94  90  90  94  91 102 102 104 103  99  90
  96 105  94  92  71  60  67  65  66  72  65  66  60  74  92 113
 114 103  77  70  74  72  62  61  63  81  79  86  76  90 117 115
 117  99  93  92  92  90  79  83  84 107 113 121 121 121 120 119
 119 120 121 119 117 119 116 115 110 115  94  87  87  89  88  97
 119 121 119 121 122 122 119 119 118 116 117 110  89  90  92  83
  97 107 111  80  91 117 122 122 122 121 119 114 116 119 122 121
 120 118 108 117 117 117 119 121 119 121 118 119 122 118 118 114
 115 100  97  96  88 102 103  98  85  84  81  82  84  93 112 113
 113  79 116 119 119 122 123 121 121 120 123 122 120 119 122 122
 122 121 115 117 122 122 122 122 117  99 105  80  97 101 104 110
  92 106 117 120 120 119 122 117  76  89  86  84  74  76  84  74
  65  61  81  63  60  68  71  87  66  63  75  67  76  84  77  64
  80  77  80  60  75 117 123 121 104 100 103  89  85  84  77  75
  78  79  71  68  68  80  77  76  80  79  82  76  78  75  77  76
  77  90 118 119 122 123 123 123 121 115 100 104 119 122 123 123
 123 119 111  96 113 119 123 122 122 122 116 100 104  75  76 102
 103 104 104 105 107 105 105 112 110  83 117 118 106  95 120 122
 122 120 119 112  93 119 118 121 122 121 120 122 122 122 121 119
 122 122 121 101 113  95 108  84  96  86  96  98 101  95 103 110
 120 120 120 122 122 121 121 120 122 122 120 121 122 121 121 120
 113 100 118 121 121 117 115  95 100  77  85  87  84  81  69  64
  68  65  81  63  60  60  60  64  73  72  66  66  68  69  70  68
  67  60  60  60  65  60  60  72  76  60  60  60  60  60  60  75
  78  60  60  60  63  75  67  70  64  60  63  67  60  64  78  88
  92  93  92  92  86  88  94  91  99  92  86  95  97  98  93  97
%EOF


ENTER LOG DATE (DD/MM/YR) : 20/08/79.

ENTER SITE CODE (5 CHARS) : 35950
ENTER USER CODE (4 CHARS) : 4673
 ENTER JOB CODE (3 CHARS) : 170

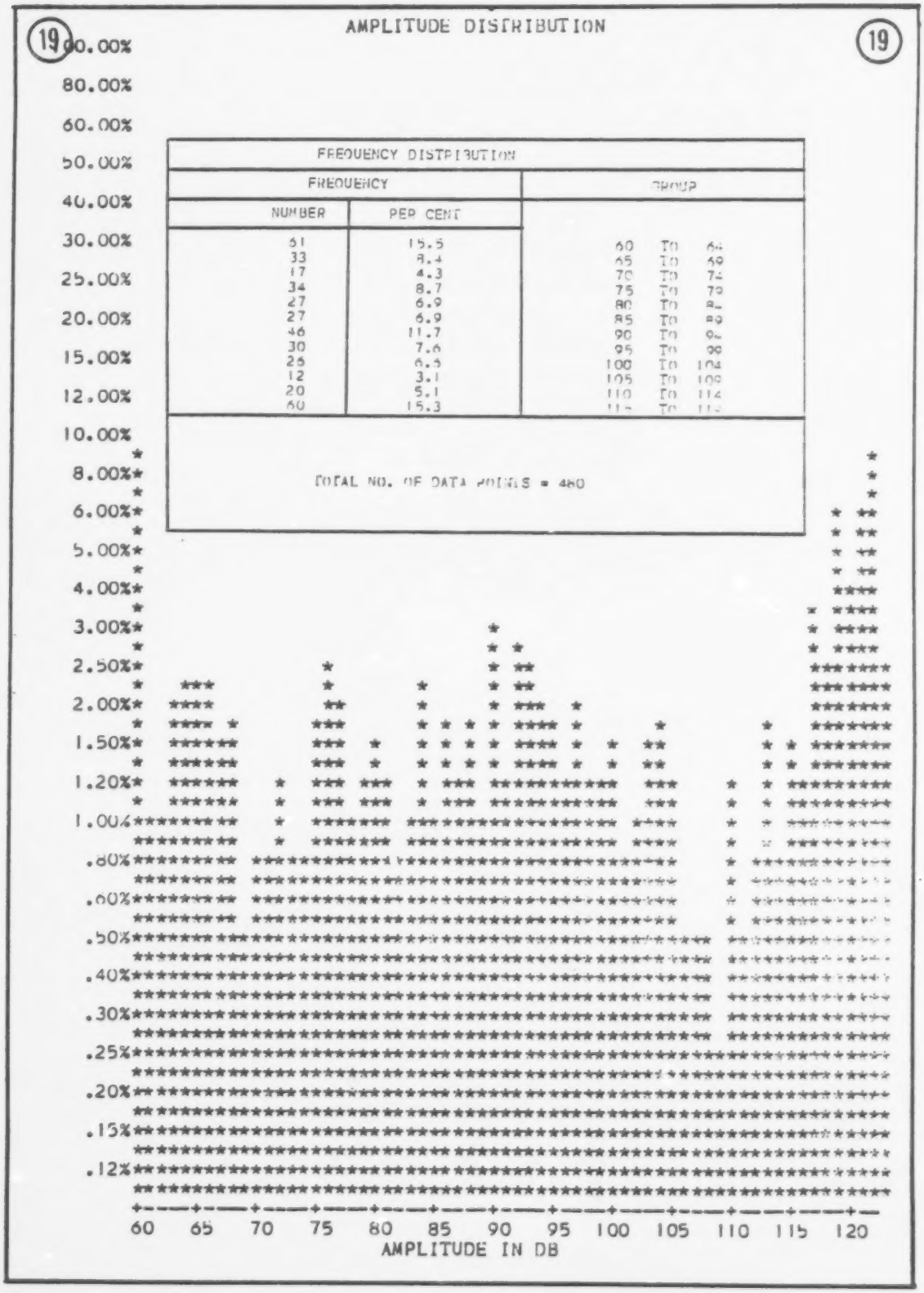

   DATA LOGGED :20  AUG 1979          DATA ANALYZED : 25 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : 35950
SERIAL NUMBER : 1220                      JOB CODE : 170
      BASELINE : 60 DB                   USER CODE : 4673
DYNAMIC RANGE : 64 DB                    THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8H 0M 0             STANDBY TIME =   0H 2M3

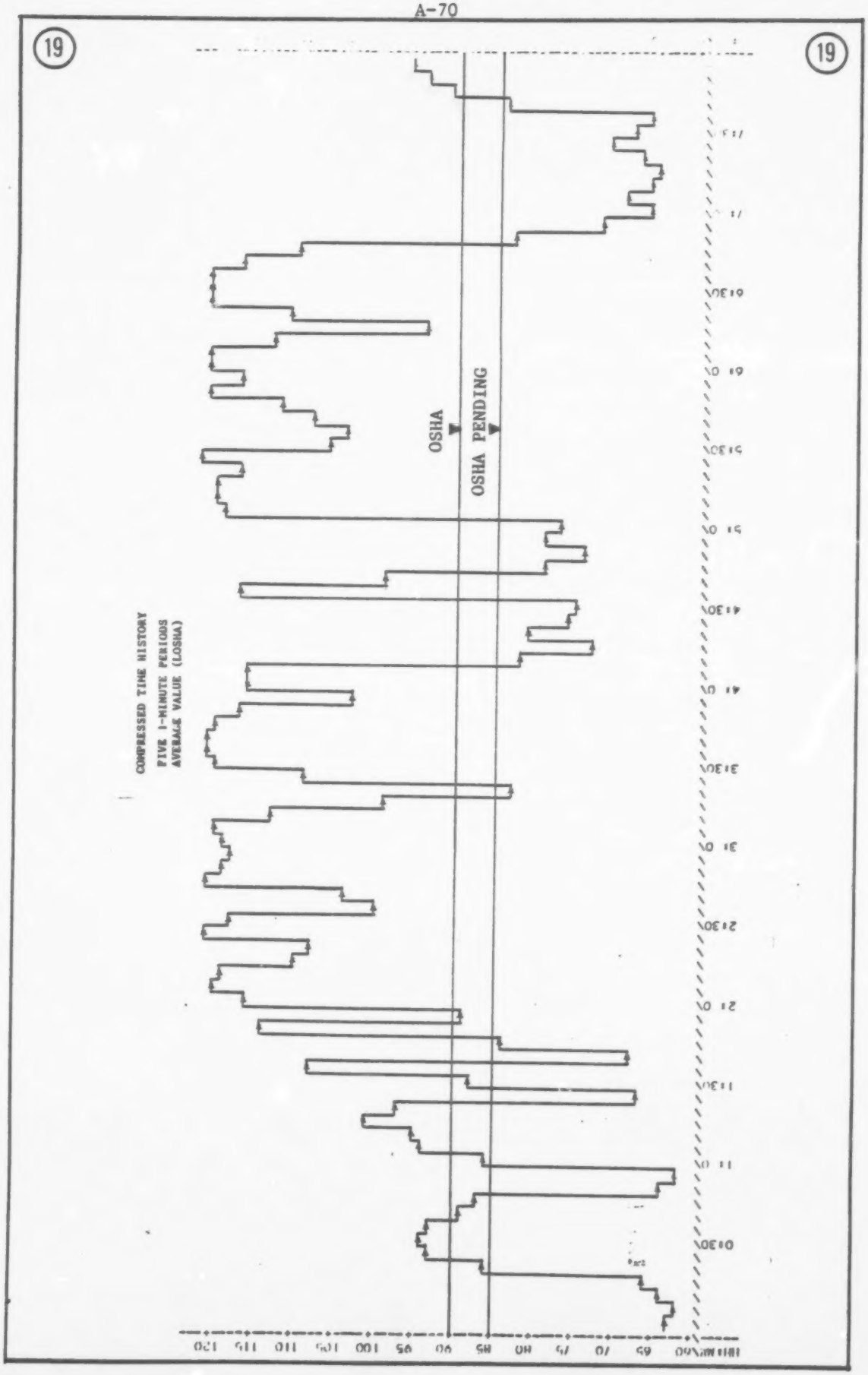

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOGA                          ANTILOG
HOUR    CURRENT   CUMULATIVE        CURRENT   CUMULATIVE
   1      86.2        86.2          7.334        7.33
   2     100.7        96.6         55.248       62.58
   3     116.7       104.6        508.047      570.63
   4     116.8       112.2        510.331     1080.96
   5     106.6       111.4        125.655     1206.61
   6     116.4       112.5        486.676     1693.29
   7     116.6       113.2        501.579     2194.87
   8      84.9       112.3          6.170     2201.04
MIN. COMP. =  60 DB                MAX. COMP. = 123 DB
ARITHMETIC MEAN =  94 DB
STD. DEVIATION =  22 DB
VARIANCE =484 DB
```

(19)


19
AMPLITUDE DISTRIBUTION
19
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
51 15.5 60 TO 64
33 8.4 65 TO 69
17 4.3 70 TO 74
34 8.7 75 TO 79
27 6.9 80 TO 84
27 6.9 85 TO 89
46 11.7 90 TO 94
30 7.6 95 TO 99
25 6.4 100 TO 104
12 3.1 105 TO 109
20 5.1 110 TO 114
60 15.3
TOTAL NO. OF DATA POINTS = 480
60.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


19
19
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
65
70
75
80
85
90
95
100
105
110
115
120

(20)

```
PLACE TAPE IN READER (USE TYPE A "SPACE" AND A "RETURN")
  1  26  50  1214    60    64     4     1
     119     115200   480
  66  63  65  60  70  60  67  61  61  62  64  68  72  60  65  60
  60  67  64  61  72  79  84  87  78  88  93  97  98  97  94  77
  60  60  60  60  60  60  61  62  60  69  62  60  60  60  67  75
  75  74  74  78  75  74  70  77  75  66  77  77  77  81  76  76
  77  73  65  74  71  71  69  74  72  92  93  93  97  97  94  87
  97  93  96  94  95  94  95  97  89  94  90  93  83  68  62  67
  62  72  68  71  70  70  73  60  62  65  67  69  66  56  52  61
  66  81  65  84  97  96  98  98  98  91  87  86  82  65  61  71
  88  85  98  96  92  98  92  93  82  82  82  82  84  85  84  82
  82  82  82  82  82  82  82  84  84  89  85  85  87  88  81  84
  87  83  84  84  87  88  88  87  95  89  89  88  88  78  71  74
  86  86  80  88  88  88  89  88  87  89  89  90  90  92  86  86
  89  89  86  88  86  85  86  85  85  85  85  87  86  88  86
  85  80  86  87  87  87  85  86  81  88  87  85  86  85  84  91
  87  85  86  96  89  88  89  90  93  92  94  94  93  94 101  91
  90  91  96  91  90  93  93  94  94  91 109 111 109 106  91  90
 110 110 110 110 110 111 111 111 111 111 111 111 111 112 112 112
 112 112 109  89  89  93 111 105  90  90  90  91  91  90  91  86
  90  89  84  88  96  64  78  66  66  72  65  66  60  66  67  67
  60  74  69  75  74  71  66  72  81  77  80  96  91  92  91  91
  91  97  95 101 102  99  97 102 102  96  98 101 100 101 103  92
  83  82  85  84  90  93  94  87  92  83  84  84  83  83  84  84
  85  86  85  85  86  86  86  85  85  85  85  85  85  85  86  86
  85  86  85  84  84  84  87  89  88  90  88  89  89  88  88  88
  89  88  89  89  89  88  87  89  88  86  87  87  88  87  86  85
  86  86  87  85  85  96  93  81  80  91  91  60  74  74  62  60
  61  61  62  62  60  60  60  60  60  60  62  60  68  70  66  60
  60  60  61  67  71  75  72  65  76  69  70  68  62  70  65  75
  60  60  67  69  70  62  64  68  82  98 104  90  85  86  96 106
  98  64  67  65  81  88  91  91  99  99 101  93  90  97  99  99
%EOF


ENTER LOG DATE (DD/MM/YR) : 14/09/79
ENTER SITE CODE (5 CHARS) : 42954

ENTER USER CODE (4 CHARS) : 4296
 ENTER JOB CODE (3 CHARS) : C80

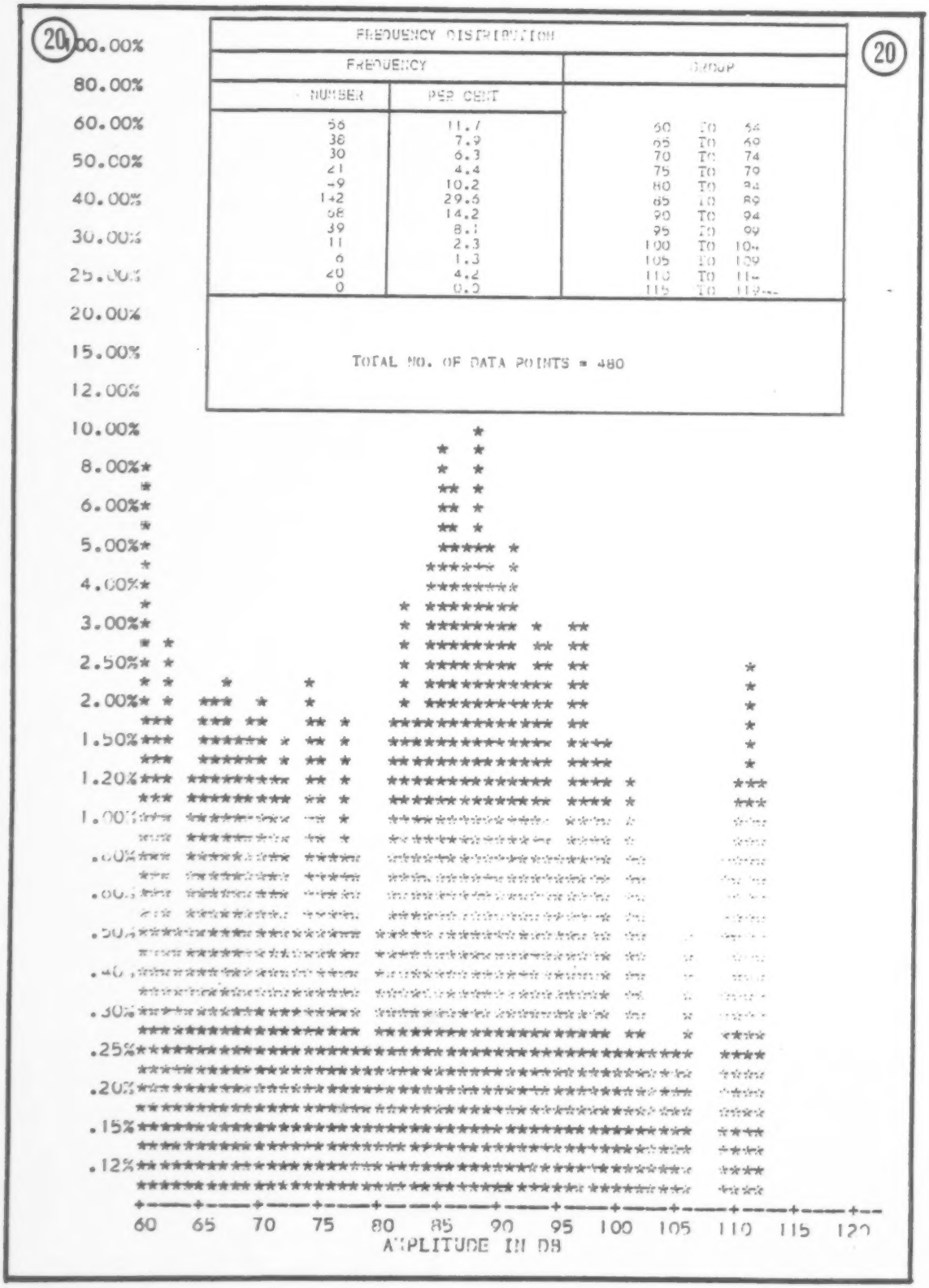

   DATA LOGGED :14 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 42954
SERIAL NUMBER : 1214                        JOB CODE : C80
      BAUDLINE : 60                        USER CODE : 4296
DATA BITS/WORD : 8                        TIMECONST. : 60
SAMPLING RATE : 4/SEC                  TOTAL SAMPLES =  115200
TEST DURATION =  8 HRS                 SITE TIME     =  8 HRS

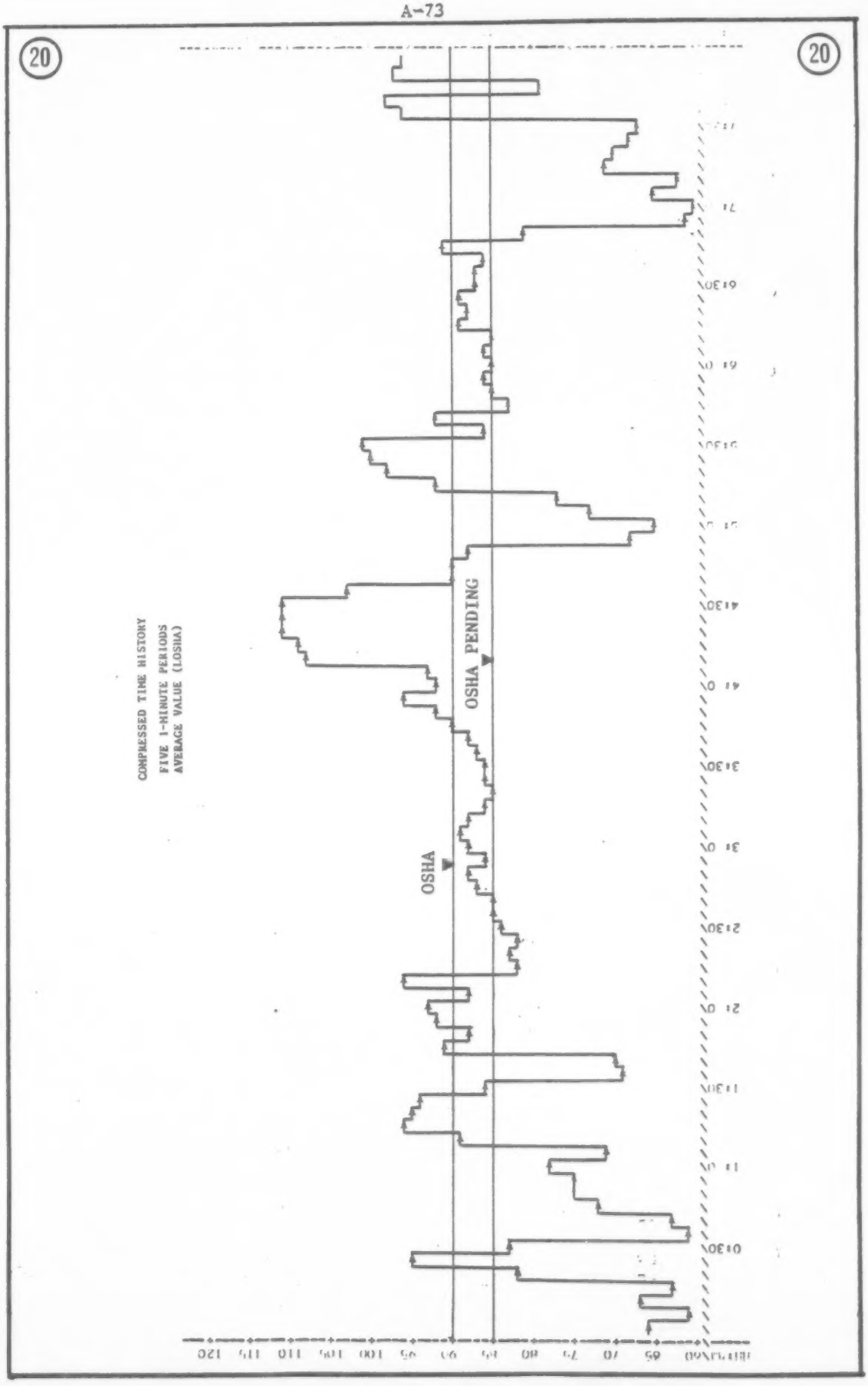

          TIME HISTORY ANALYSIS

DOSE EQUIVALENT RATE (D.E.R.) CALCULATIONS
USE BASIC CALIBRATION POLYNOMIAL
DER = C0 + C1 * CNT + C2 * CNT**2
CALIBRATION (COUNTS) TO DER = 0.0
CALIBRATION (DER) TO DER = 0.0
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

HOUR        DOSE                          DOSE
        CURRENT  CUMULATIVE           CURRENT  CUMULATIVE
   1       80.7       80.7             3.454        3.45
   2       89.5       86.4            11.419       15.07
   3       87.9       [illegible]      9.[illegible]  24.46
   4       89.1       87.5            11.[illegible]  35.44
   5      104.7       90.4            96.[illegible]  131.73
   6       92.2       94.9            17.041       148.77
   7       86.4       93.2             7.[illegible]  156.30
   8       89.4       93.7            11.[illegible]  167.41
MIN. COMP. =  60 DB                 MAX. COMP. =  11[illegible] DB
ARITHMETIC MEAN =  83 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```

(20)


20
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
56 11.7 60 TO 64
38 7.9 65 TO 69
30 6.3 70 TO 74
21 4.4 75 TO 79
49 10.2 80 TO 84
142 29.6 85 TO 89
68 14.2 90 TO 94
39 8.1 95 TO 99
11 2.3 100 TO 104
6 1.3 105 TO 109
20 4.2 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
100.00%
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


20
20
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120 115 110 105 100 95 90 85 80 75 70 65 60
01:30
02:00
02:30
03:00
03:30
04:00
04:30
05:00
05:30
06:00
06:30
07:00

(21)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1215    60    64     4     1
     198     115200  480
 63  61  60  61  60  66  62  63  60  65  60  60  68  69  60  66
 60  60  66  60  63  74  76  86  83  76  63  74  65  68  63  60
 60  60  60  60  60  60  60  60  60  65  61  60  60  60  60  70
 75  73  74  75  78  76  74  72  78  73  72  78  74  76  80  77
 78  75  70  67  74  73  74  71  81  83  81  81  83  87  85  82
 98  96  96  97  95  96  96  97  97  92  92  90  72  76  84  87
 63  66  60  73  69  70  74  70  71  71  73  66  65  80  62  60
 60  66  63  60  60  60  60  60  60  60  60  60  60  60  60  60
 61  60  63  66  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  66  65  60  60
 60  60  60  60  60  60  60  64  68  66  60  60  68  60  60  60
 60  60  60  61  64  60  60  60  60  60  60  60  60  60  60  60
 62  60  60  61  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 62  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  70  60  60  60  60  62  64  69  65  60  61  62  61  60
 61  64  60  60  64  60  61  60  64  60  63  60  61  60  60  63
 66  68  69  64  71  71  73  74  68  60  63  60  66  64  62  71
 65  61  79  65  74  72  73  69  73  66  76  67  60  69  75  60
 60  60  60  68  71  70  71  64  61  62  60  64  60  60  64  60
 60  61  60  60  60  60  60  60  63  71  65  60  70  60  60  60
 61  71  64  60  60  60  60  61  65  60  61  61  62  60  60  60
 61  66  60  60  60  60  65  60  60  63  60  66  60  62  62  60
 60  60  75  71  60  60  61  60  60  81  62  60  60  60  60  60
 60  60  60  61  60  60  61  73  72  69  63  69  63  60  69  64
 65  60  60  60  62  62  60  60  60  60  60  60  60  63  60  60
 61  63  60  60  60  60  60  60  60  60  60  60  60  68  63  60
 61  60  60  67  60  68  63  60  68  63  60  68  60  61  63  67
 77  60  65  61  69  63  66  67  67  56  69  71  74  75  78  75
 75  68  63  79  74  82  85  84  96  96  97  87  87  94  95  95
EOF

ENTER LOG DATE (DD/MM/YR) : 14/09/79
ENTER SITE CODE (5 CHARS) : 42954
ENTER USER CODE (4 CHARS) : 4227
 ENTER JOB CODE (3 CHARS) : C80

   DATA LOGGED :14 SEPT 1979
        LOGGER : DB-301/26
 SERIAL NUMBER : 1215
      BASELINE : 60 DB
 DYNAMIC RANGE : 64 DB
 SAMPLING RATE : 4/SEC
 TEST DURATION =  8: 0 0

DATA ANALYZED : 27 SEPT 1979
    SITE CODE : 42954
     JOB CODE : C80
    USER CODE : 4227
 RESOLUTION   : 0.5 DB
TOTAL SAMPLES = 115200
 STARTING TIME =  0: 0: 0

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
L90 LEVEL = 70.0 / 2.305
CALCULATED (CUMULATIVE) RATE = 0.0
CALCULATED (CUTOFF) LEVEL = 0.0 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

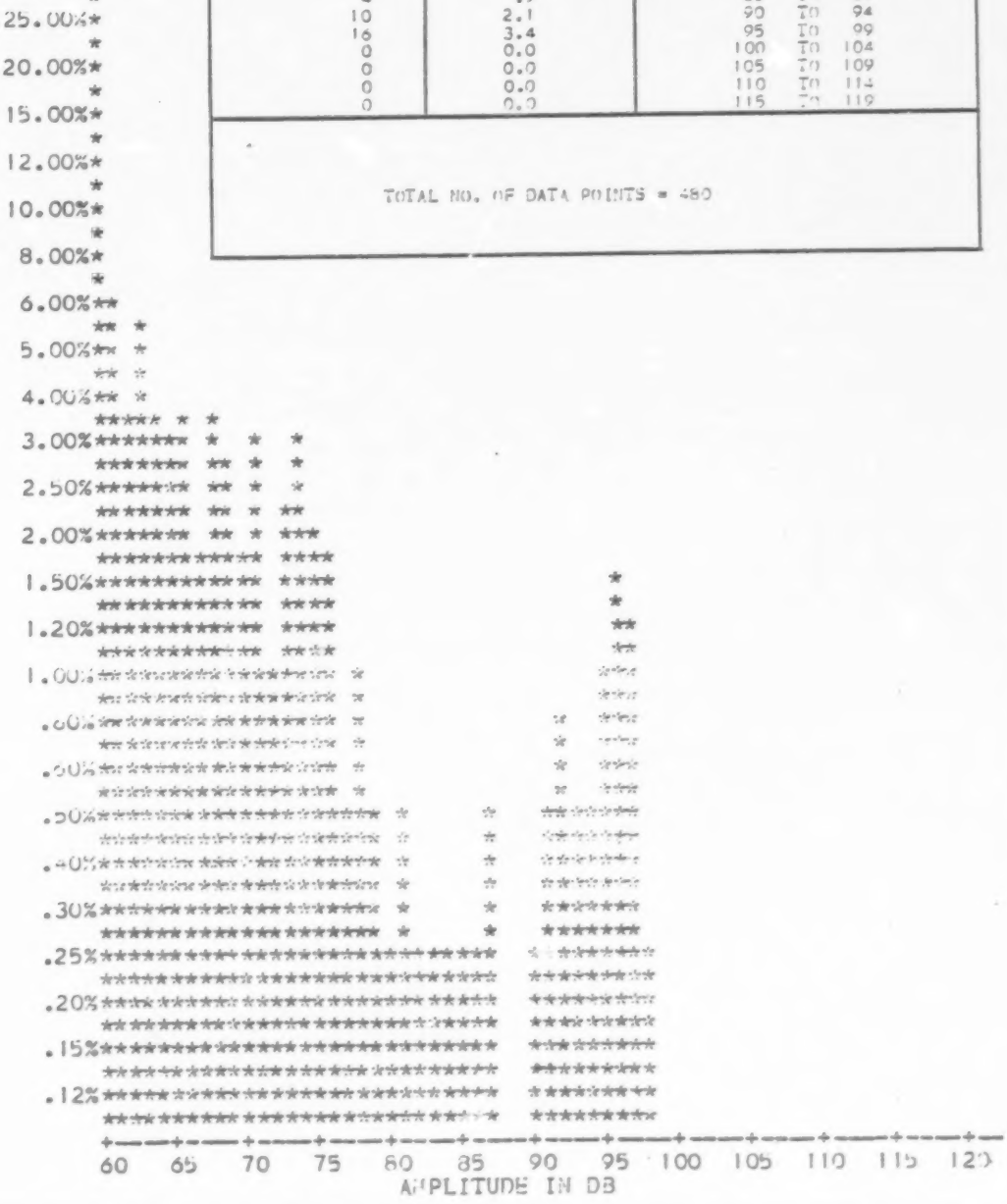
TIME      LEVEL                    NOISE
HOUR   CURRENT  CUMULATIVE    CURRENT  CUMULATIVE
   1     70.4      70.4        .824       .82
   2     87.4      83.0       8.092      8.52
   3     61.2      83.3        .431      8.65
   4     60.2      78.4        .200      8.85
   5     69.8      77.1        .502     10.45
   6     63.8      76.0        .330     10.78
   7     64.5      75.1        .366     11.14
   8     81.3      76.3       3.723     14.87
MIN. COMP. =  60 DB          MAX. COMP. =  98 DB
ARITHMETIC MEAN =  85 DB
STD. DEVIATION =  9.53
VARIANCE =  91 DB
```

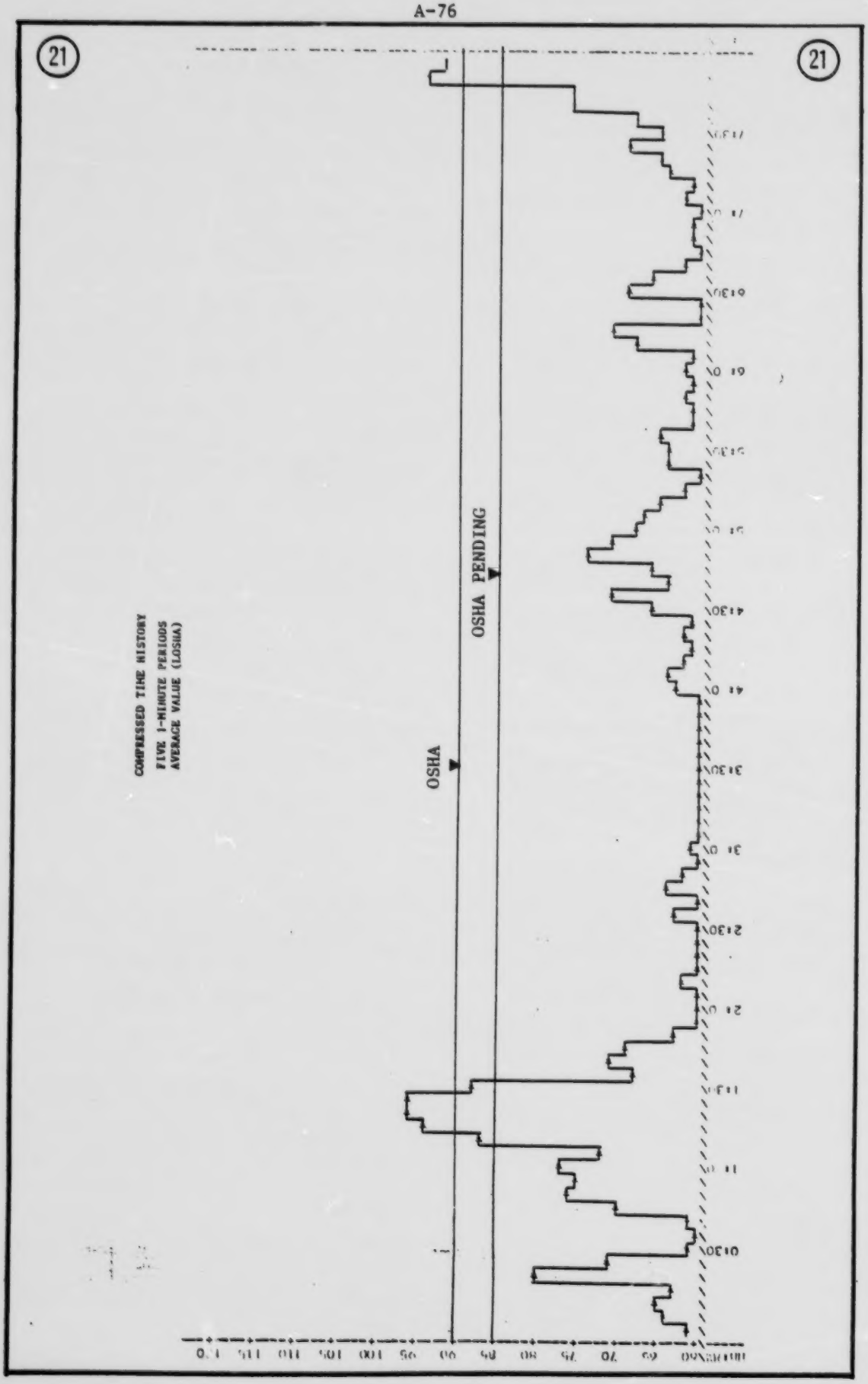
(21)

(21) AMPLITUDE DISTRIBUTION (21)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
308	65.5	60 TO 64
59	12.6	65 TO 69
44	9.4	70 TO 74
23	4.9	75 TO 79
6	1.3	80 TO 84
4	.9	85 TO 89
10	2.1	90 TO 94
16	3.4	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




21
21
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:30
2:30
3:30
4:30
5:30
6:30
7:30
60
65
70
75
80
85
90
95
100
105
110
115
120

(22)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(22)

```
  1  26  80  1224    60   64    4    1
     28      115200  480
 70  73  77  60  60  60  60  67  60  63  67  68  76  72  72  86
 92  96  96  95  96  96  96  96  97  95  95  95  94  93  95  94
 94  96  96  94  86  93  92  85  70  60  60  60  60  60  60  60
 60  60  60  64  83  93  87  85  74  71  72  60  60  60  62  67
 64  82  83  76  75  65  62  [illegible]
 99  98  99  100 [illegible]
105 105 100 107 107 108 108 106 107 106 106 105 108 109 107 109
110 111 111 109 111 111 110 111 111 110 109 105 110 111 111 111
103 110 111 111 111 111 110 110 111 110 110 110 111 111 111 111
109 107 110 107 105 104 102 102 103 104 106 106 110 110 110 110
106 108 109 111 111 111 112 113 113 113 113 112 112 110 108 107
101 [illegible]
101 106 100 100 99  103 102 102 101 101 101 101 100 99  99  96
 99 100 99  97  106 105 82  104 86  91  95  95  91  87  86  83
 94 94  94  94  94  95  94  93  93  97  97  96  98  105 98  97
105 101 96  86  70  92  96  78  65  77  60  60  60  60  60  60
 60 60  62  65  60  60  73  62  65  60  60  60  63  65  60  68
 72 60  60  60  61  60  67  77  61  80  90  98  88  78  76  76
 65 96  99  87  101 105 105 105 104 103 109 109 111 109 107 107
111 110 110 109 104 107 110 110 109 109 105 109 110 110 109 104
110 111 112 111 107 103 103 107 106 107 95  98  101 108 110 110
109 103 105 109 111 109 110 103 106 103 102 100 103 100 99  86
102 106 105 106 106 103 104 105 102 100 97  105 108 106 107 106
105 107 105 107 109 108 107 101 97  107 107 107 108 107 98  108
108 107 108 108 104 92  93  95  100 88  97  109 109 110 91  102
103 103 99  101 107 97  104 105 107 111 108 108 107 110 110 108
104 109 110 109 106 109 101 108 93  90  105 105 106 105 97  97
 96  97  96  90  89  88  73  78  90  95  99  81  62  63  60  68
 60  63  66  60  86  82  83  88  84  91  92  84  84  83  89  93
 82  77  93  93  93  92  94  96  94  94  93  92  93  89  73  84
/EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 13/07/79
ENTER SITE CODE (5 CHARS) : CC201
ENTER USER CODE (4 CHARS) : 1597
 ENTER JOB CODE (3 CHARS) : 272
```

```
    DATA LOGGED :18 JULY 1979          DATA ANALYZED : 14 SEPT 1979
         LOGGER : Rs-3S1/2S                 SITE CODE : CC201
SERIAL NUMBER : 1224                         JOB CODE : 272
       BASELINE : 60 DB                    USER CODE : 1597
DYNAMIC RANGE : 64 DB                      THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STARTED AT =   7: 0: 7
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOUR LOST = 60 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 3 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

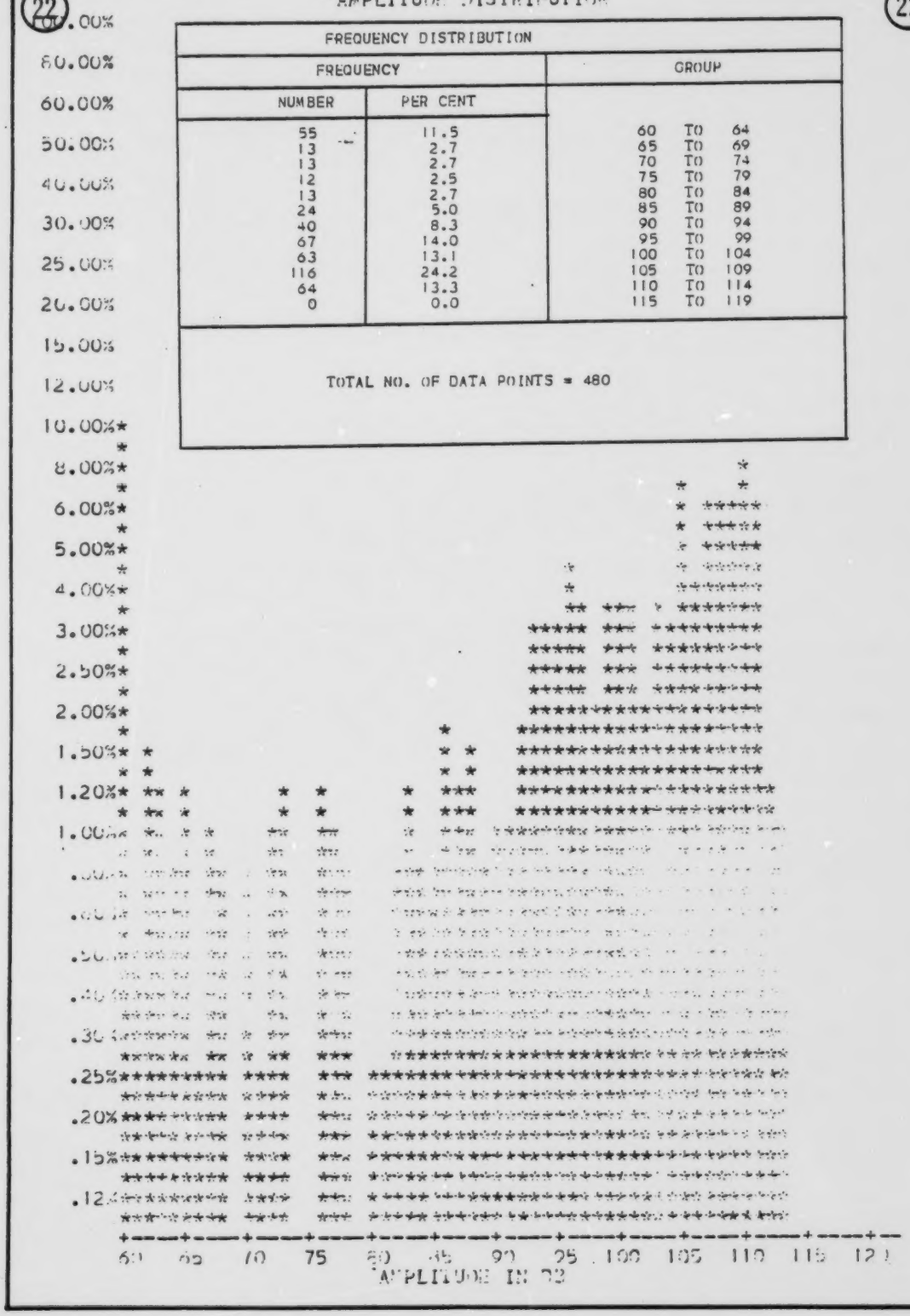
TIME	LOSS		ENERGY	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	88.7	88.7	10.370	10.37
2	104.4	103.2	21.440	102.21
3	109.3	104.6	142.605	251.82
4	99.0	103.6	43.435	321.30
5	94.3	102.4	22.991	350.89
6	107.2	103.5	136.854	495.76
7	105.8	103.9	111.439	697.20
8	95.4	103.2	26.571	623.77

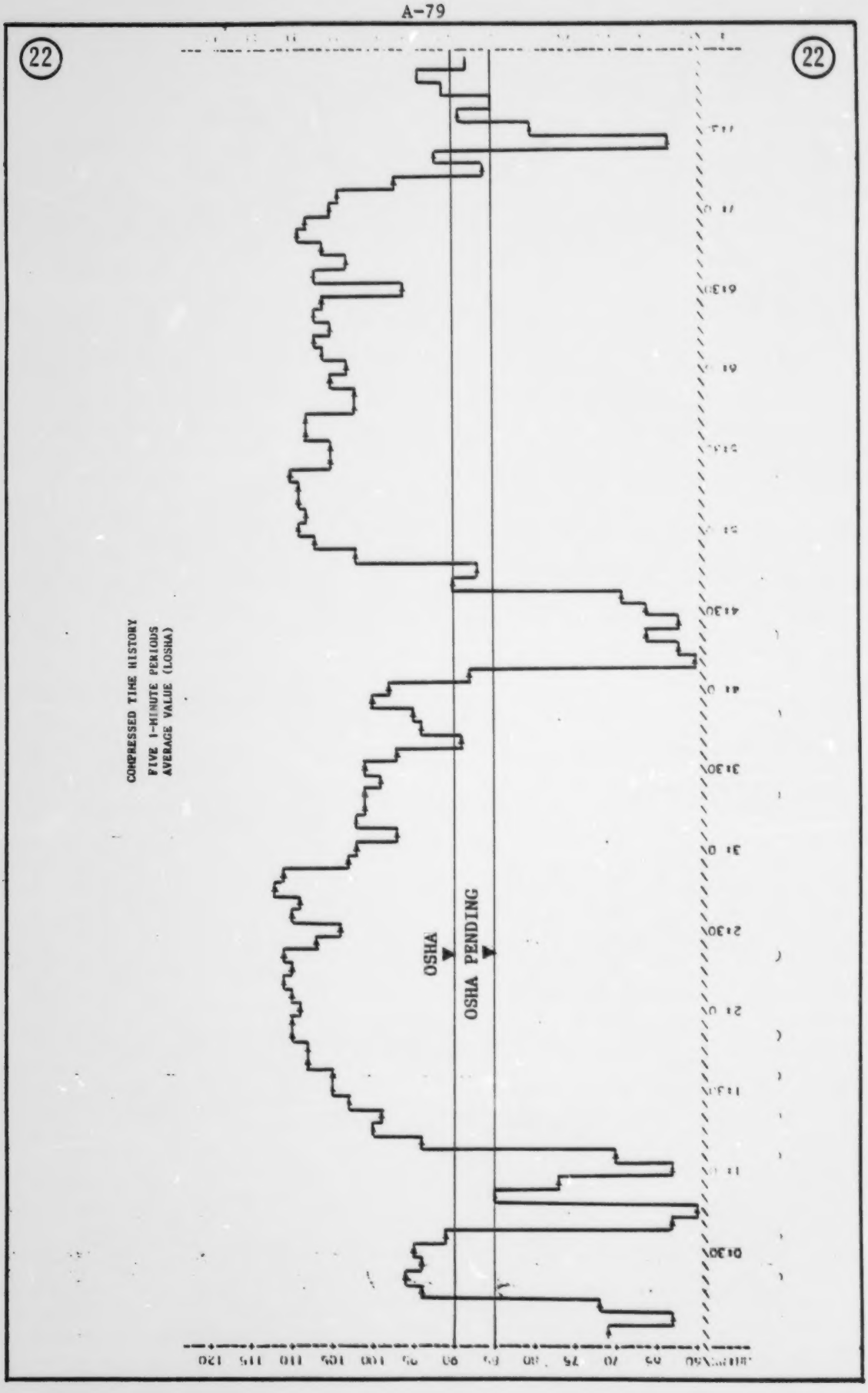
MIN. COMP. = 60 DB MAX. COMP. = 113 DB
ARITHMETIC MEAN = 94 DB
STD. DEVIATION = 15 DB
VARIANCE =256 DB

(22) AMPLITUDE DISTRIBUTION (22)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
55	11.5	60 TO 64
13	2.7	65 TO 69
13	2.7	70 TO 74
12	2.5	75 TO 79
13	2.7	80 TO 84
24	5.0	85 TO 89
40	8.3	90 TO 94
67	14.0	95 TO 99
63	13.1	100 TO 104
116	24.2	105 TO 109
64	13.3	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




22
22
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
41:30
31:30
21:30
120
115
110
105
100
95
90
85
80
75
70
65

(23)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1212    60    64     4     1
   10492     115200   480
  65  66  74  60  60  60  64  60  60  60  60  71  63  61  63  74
  63  79  74  90  91  91  90  91  91  91  91  91  91  90  90
  90  90  90  90  91  90  90  91  91  91  91  91  90  90  91  90
  90  88  84  89  92  90  93 103 102 100 102 102 100 102 102 102
  95  83  63  65  60  75  93  87  60  73  60  60  69  61  79  85
  91  95  88  90  89  95  94  94  85  82  73  80  84  82  85  94
  84  84  84  84  84  84  84  84  84  84  84  84  84  84  84  84
  84  84  84  85  84  84  84  85  84  84  84  84  84  84  85  84
  84  84  84  84  84  84  84  84  85  84  84  84  84  84  82  96
  97  97  97  97  97  97  97  97  97  97 100  97  94  97  94 100
  90  82  83  89  96  96 110 110 111 111 111 110 108 110 111 111
  84  83  83 102 110 110 110 110 102 110 111 111 111 111 110 109
  97  93  99 110 110 111 110 110 108 103 110 111 110 111 110 110
 105  92  95  82  82  82  82  83  83  83  92  92  95  82  91  97
  83  83  83  83  83  83  84  83  84  84  84  83  83  84  83  83
  83  89  93  83  83  83  83  83  83  92  98  99 110 112 111 110
 111 110  98 110 110 111 111 111 110 111 109  87  94  82  80  80
  80  80  80  80  80  80  80  81  80  80  80  80  80  80  80  80
  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80
  80  80  80  80  80  80  80  80  80  80  80  80  80  80  80  83
  83  94  96  96 109 110 110 112 112 108 106 112 112 113 112 110
 113 112 112 112 112 112 106  97 107 112 112 112 109 107 112 112
 112 112 104  95  93  91  95  92  97  94  89  97  99 111 113 113
 112 112 109 105 113 113 113 113 112 106  96 101 111 110 109  94
 111 110 110 112 107 113 113 113 112 101  97 110 112 112 113 112
 109 113 112 113 113 107  96  99  85  85  85  84  81  75  72  72
  73  69  71  72  70  73  72  70  69  69  74  72  75  73  76  71
  70  72  77  78  73  81  77  72  81  76  68  72  74  68  71  70
  71  69  69  69  67  72  69  71  71  67  72  73  72  70  73  72
  71  71  72  70  68  69  74  72  71  71  72  69  73  72  70  74
%EOF


ENTER LOG DATE (DD/MM/YR) : 23/07/79

ENTER SITE CODE (5 CHARS) : CC201
ENTER USER CODE (4 CHARS) : 0335
 ENTER JOB CODE (3 CHARS) : 271


   DATA LOGGED :23 JULY 1979          DATA ANALYZED : 17 SEPT 1979
        LOGGER : DS-301/26                 SITE CODE : CC201
SERIAL NUMBER : 1212                       JOB CODE : 271
      BASELINE : 60 DB                     USER CODE : 0335
DYNAMIC RANGE : 64 DB                      THRESHOLD :
SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0            STARTING TIME =  0:13:53

            TIME HISTORY ANALYSIS

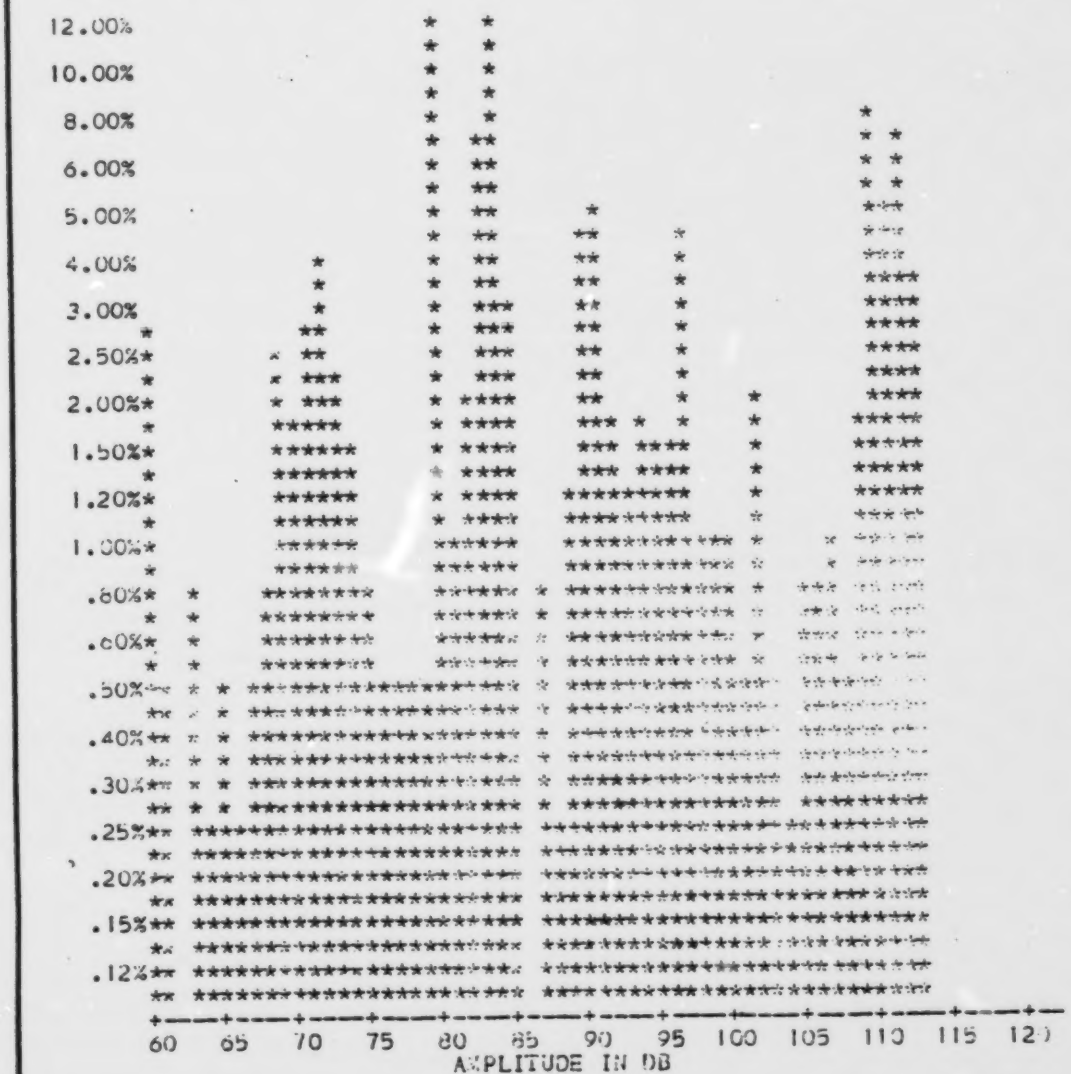
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
FOR CASE OF THE FOLLOWING:
TOTAL DOSE =
CALIBRATION (CORRELATED) LEVEL =
CALIBRATION (CORRECTED) LEVEL =
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

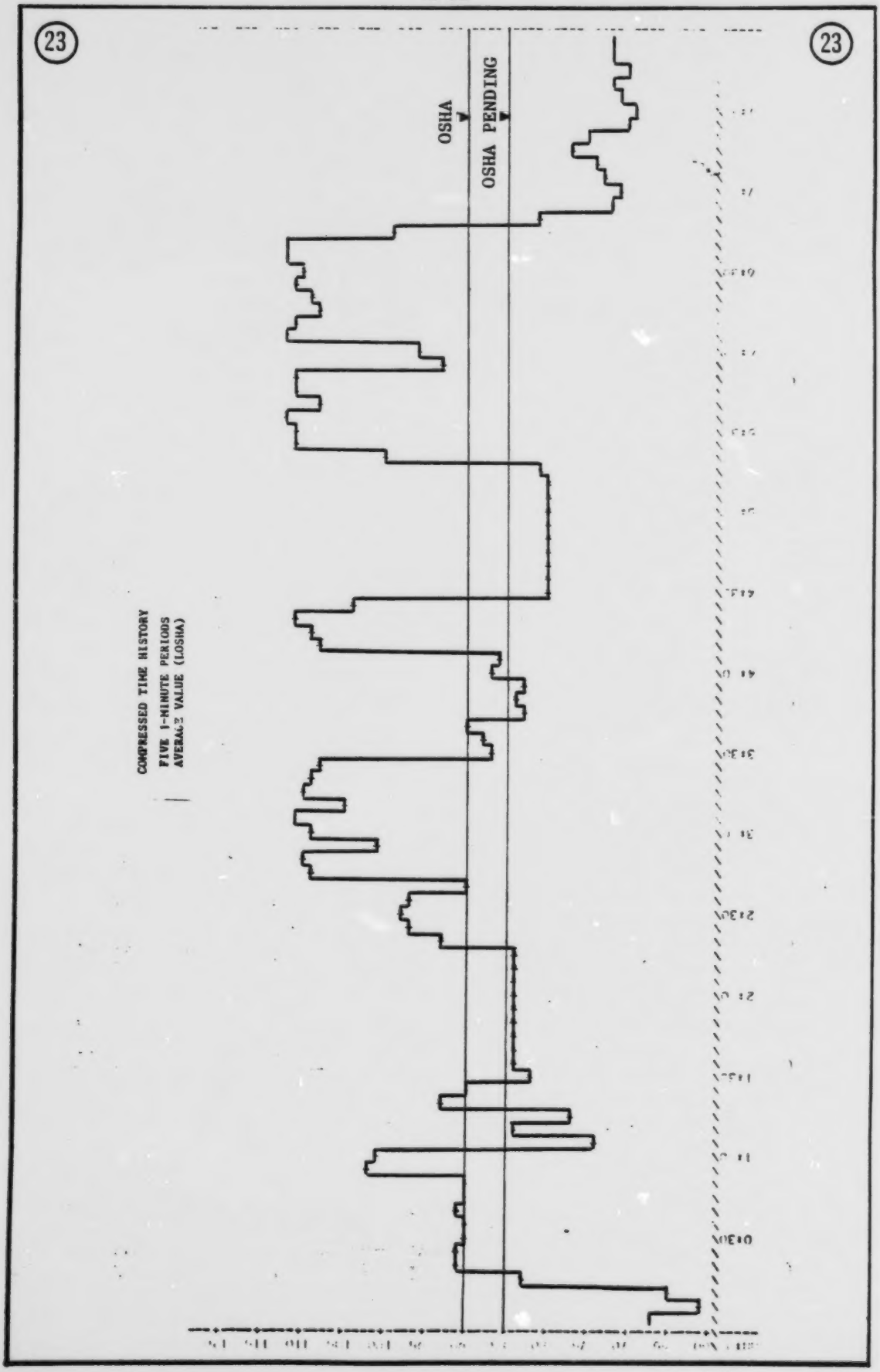
TIME          LOGIN                        LOGE
HOUR     CURRENT  CUMULATIVE          CURRENT  CUMULATIVE
   1       90.6       90.6           13.650       13.65
   2       88.6       89.8           10.548       24.20
   3       94.8       94.8           18.410       42.61
   4       94.1       94.4           95.309      161.18
   5       99.7       99.0           99.454      215.63
   6      106.2      100.8          117.566      333.20
   7      104.1      102.4          154.237      486.43
   8       72.5      101.9            1.102      487.54
MIN. COMP. =  60 DB                MAX. COMP. = 113 D
ARITHMETIC MEAN =  99 DB
STD. DEVIATION =  1
VARIANCE =72
```

(23)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
17	3.5	60 TO 64
18	3.8	65 TO 69
49	10.2	70 TO 74
11	2.3	75 TO 79
142	29.6	80 TO 84
21	4.4	85 TO 89
55	11.5	90 TO 94
37	7.7	95 TO 99
17	3.5	100 TO 104
19	4.0	105 TO 109
94	19.6	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




23
23
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
0130

(24)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  60  1224    60    64     4     1
        88       40917   170
 112 109 113 111 102 110 109 104 109 109 107  96  94  95  92  88
  94 102 109 109  95  93  87  86  86  88  90  90  92  92  94  93
  95 108 109 103 109 108 106 105 109 108  95  91  86  89  89  92
  91  93  95  94  91  92  83  82  87  91  96  85  74  67  63  60
  63  65  98  96  94  96  99  97  77 101  99  93  85  81  75  70
  76  62  79  73  84  78  82  72  82  74  73  74  70  70  64  63
  60  63  69  67  68  66  72  70  64  60  60  61  60  63  59  67
  77  65  65  77  76  71  68  77  69  64  63  65  67  61  60  60
  60  60  64  60  60  60  63  60  60  64  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  66  60  60  60  60  70  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60
```

(24)

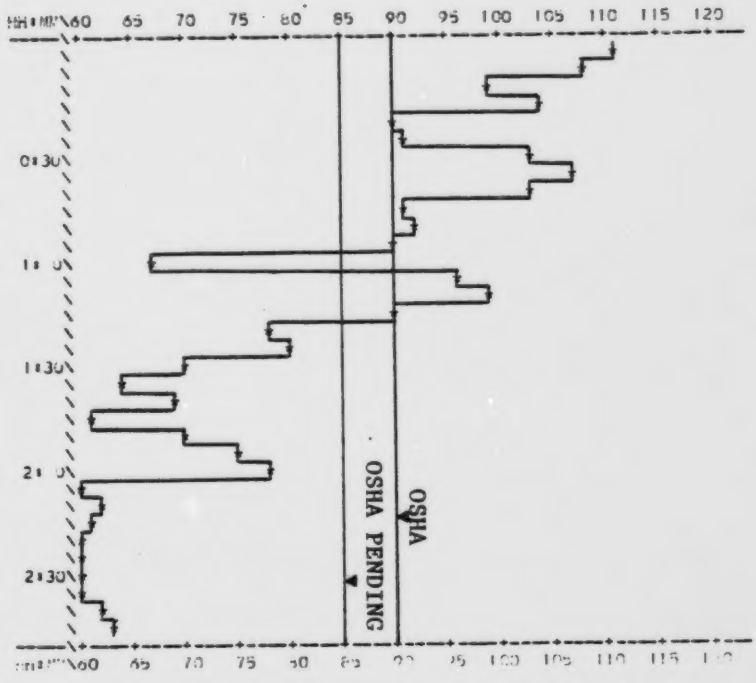
FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
369	76.9	60 TO 64
13	2.7	65 TO 69
11	2.3	70 TO 74
8	1.7	75 TO 79
7	1.5	80 TO 84
13	2.7	85 TO 89
20	4.2	90 TO 94
15	3.1	95 TO 99
4	.8	100 TO 104
16	3.3	105 TO 109
4	.8	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

(24)

(24) (24)

COMPRESSED TIME HISTORY
FIVE MINUTE PERIODS

AVERAGE VALUE (LOSHA)



(25)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1220    60    64     4     1
      36      115200   480
 76  79  75  75  75  78  70  71  79  70  74  78  79  75  74  71
 63  78  75  70  73  62  65  87  99  96  96  96  96  96  95  97
 96  96  96  92  96  93  93  85  80  60  60  60  60  60  60  60
 77  91  85  80  81  80  80  80  80  81  82  88  78  78  79  87
 79  79  79  76  77  80  79  77  77  80  79  79  80  90  74  68
 77  87  87  79  78  79  81  86  89  83  83  78  74  76  77  71
 77  88  86  74  79  85  87  86  80  80  80  81  81  80  86  96
102  80  91  88  60  64  67  70  72  70  60  60  60  60  60  60
 60  75  61  71  71  60  60  66  75  60  64  60  60  60  60  60
 90  64  65  67  79  67  75  64  78  77  92  89  85  85  72  93
 70  78  82  75  89  87  79  93  86  62  72  69  63  80  79  84
 90  84  87  85  86  74  88  66  73  61  71  78  70  74  75  81
 85  85  84  89  89  88  83  84  87  88  87  86  86  83  82  80
 89  91  90  86  81  77  92  63  60  60  60  60  60  60  60  60
 60  60  60  60  60  63  60  60  60  60  60  60  60  60  60  60
 68  63  68  66  84  94  82  77 100 104  94  91  91 107 105 103
103 101 103 105 104 103 102  97  98  98  90  90 104 105 102 101
101 104 104 101 105 104  96  86  91  80  88  84  86 103 106 104
103 102  98 107 108 107 105 105  86 105 106 102 103  94 104 104
102 101  90  88  78  69  76  77  60  64  88  87  85  79  83  84
 86  85  84  77  81  74  74  66  87  90  83  86  87  86  80  80
 60  62  67  72  98  98  63  61  86  91  73  83  84  69  73 104
105 105 101 107 109 106 103 106 106 106 102  92  97 105 106 104
103  98 107 107 105 103 104 106 107 107 105 103 102  96  98  93
 92  86  91 105 107 106 104 103 108 106 105 103 103  92 106 108
106 106 104  97  82 101 107 106 106 103 107 109 103  93  90  82
 88 100 107 104 107 108 108 107 104  94 103 104 106 106 106 107
107 106 105 103 107 107 105 103  93  93  85  74  91  96  64  61
 63  62  69  60  63  65  82  90  90  89  89  90  92  91  90  95
 95  97  94  98  99 100  98  99  98  98  94  85  80  80  83  83
EOF


ENTER LOG DATE (DD/MM/YR) : 19/07/79

ENTER SITE CODE (5 CHARS) : CC202
ENTER USER CODE (4 CHARS) : 4123
 ENTER JOB CODE (3 CHARS) : 271


   DATA LOGGED :19 JULY 1979          DATA ANALYZED : 14 SEPT 1979
        LOGGER : CR-3011/26                SITE CODE : CC202
SERIAL NUMBER : 1220                       JOB CODE : 271
      BASELINE : 60 DB                    USER CODE : 1123
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
 TEST DURATION =   8: 0: 0            STANDBY TIME =  0: 0: 0

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

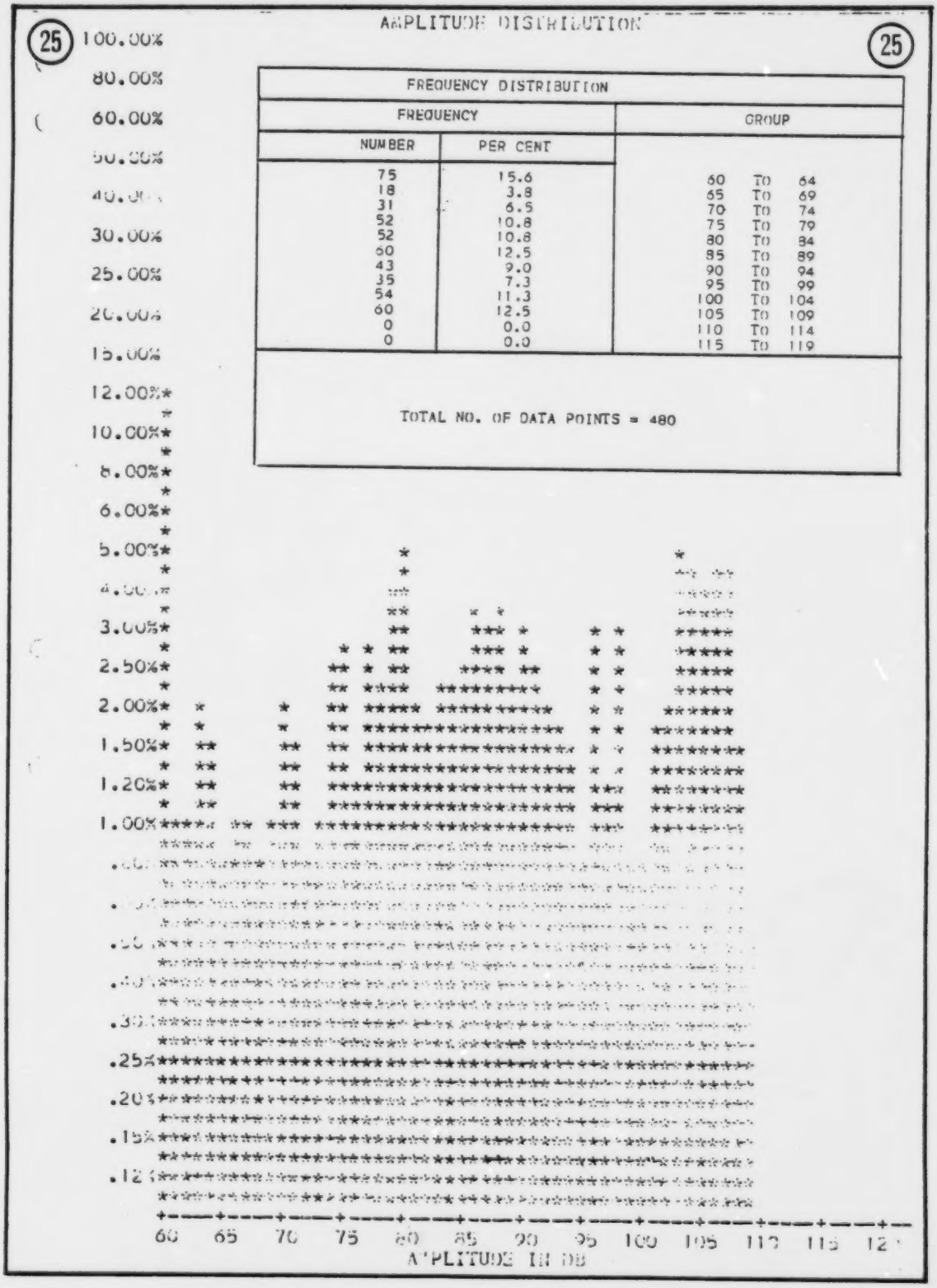
TIME          LEQ(A                          NOISE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1       87.4       87.4        8.723        8.72
   2       84.0       85.9        5.416       14.14
   3       81.8       84.6        3.532       17.73
   4       81.0       83.9        3.603       21.33
   5      101.0       91.8       57.084       78.42
   6       99.5       92.4       26.816      105.23
   7      103.5       95.5       81.294      186.53
   8       99.6       96.1       47.490      234.02
MIN. COMP. =  60 DB                    MAX. COMP. = 109 DB
ARITHMETIC MEAN =  84 DB
STD. DEVIATION =  15 DB
VARIANCE =223 DB
```

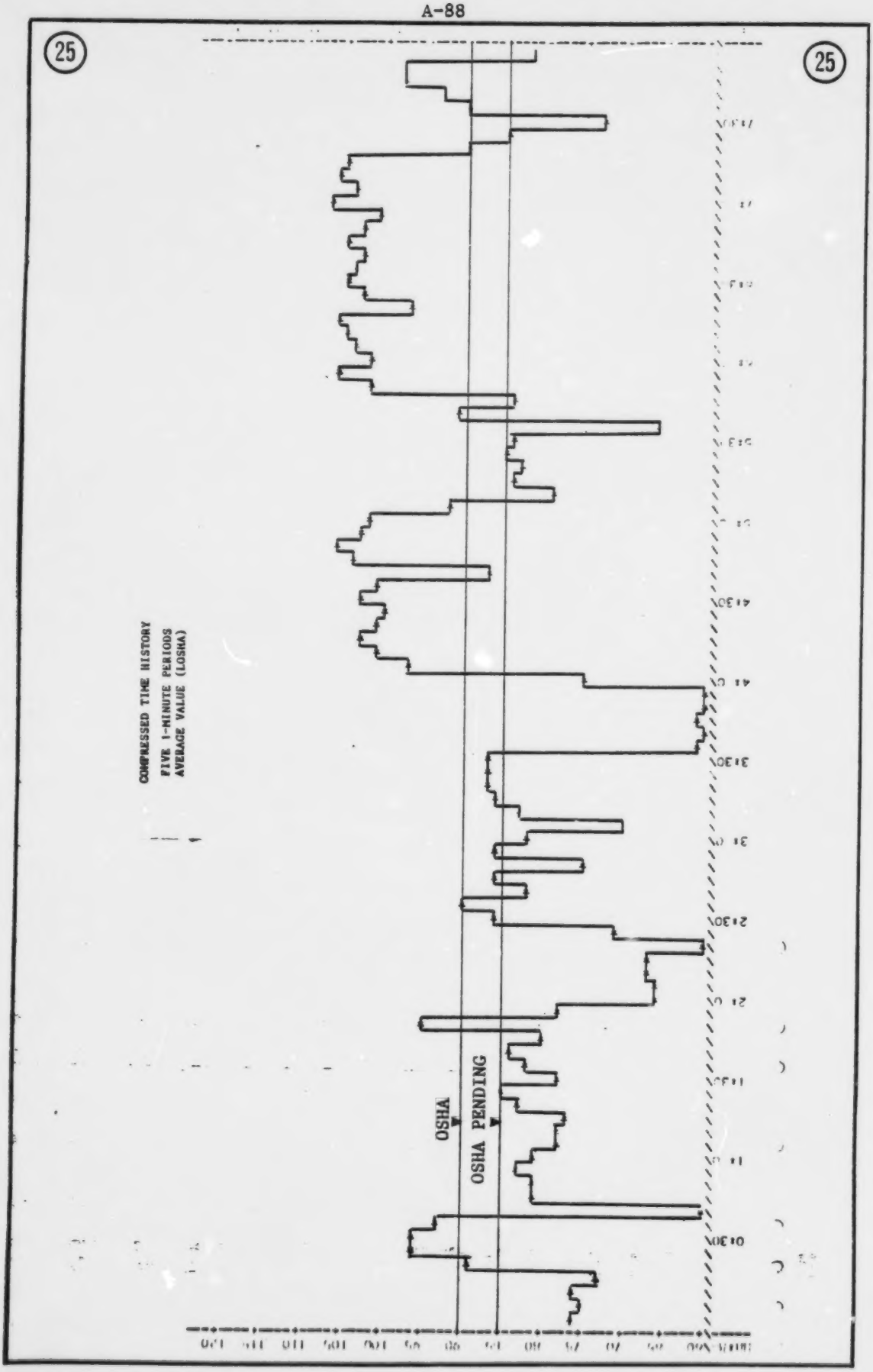
(25)

AMPLITUDE DISTRIBUTION

(25) (25)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
75	15.6	60 TO 64
18	3.8	65 TO 69
31	6.5	70 TO 74
52	10.8	75 TO 79
52	10.8	80 TO 84
60	12.5	85 TO 89
43	9.0	90 TO 94
35	7.3	95 TO 99
54	11.3	100 TO 104
60	12.5	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




25
25
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
21:30
41:30
31:30

(26)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
1 26 80 1219 60 64 4 1
65
115200 480

71	67	74	75	73	72	60	65	76	72	74	77	71	75	74	74
96	99	100	100	101	101	102	101	94	94	96	94	95	94	93	94
94	93	96	96	94	95	95	93	92	90	90	93	86	78	70	61
[illegible]															
[illegible]															
75	74	74	80	79	82	76	76	[illegible]	68	80	80	81	82	82	82
102	107	106	103	109	107	108	106	107	103	107	106	[illegible]	107	107	107
107	107	107	94	93	92	90	90	93	101	107	107	106	105	103	103
[illegible]															
99	98	99	102	102	103	103	99	101	103	104	104	105	101	99	102
103	103	104	101	97	98	103	106	107	107	102	107	101	98	98	91
[illegible]															
95	97	98	106	106	100	106	105	105	105	96	102	106	105	105	105
105	101	106	106	107	107	105	96	79	90	73	88	96	92	97	97
95	94	104	105	105	105	101	101	102	104	104	[illegible]	104	[illegible]	[illegible]	[illegible]
95	103	103	103	103	99	102	104	104	104	102	101	103	103	103	102
102	104	104	103	100	101	102	102	102	102	99	102	103	103	103	101
102	103	102	92	92	96	98	96	101	105	105	98	98	104	104	99
105	103	101	101	99	101	99	98	83	100	98	96	94	97	89	89
93	78	97	99	96	79	86	87	81	95	97	89	74	77	102	100
100	98	100	104	105	103	99	99	101	98	102	105	105	101	105	105
106	101	90	85	88	86	84	90	80	90	97	95	96	91	97	103
100	85	90	97	101	105	105	104	103	102	101	104	104	96	100	97
98	82	84	81	76	79	90	80	84	94	82	93	95	82	88	96
103	105	105	105	104	98	103	104	104	104	103	96	95	88	90	74
86	94	94	81	80	97	69	71	67	92	96	92	92	92	92	92
92	92	90	92	102	89	105	104	104	104	104	99	99	75	94	95
95	95	95	95	96	94	94	94	95	93	88	85	81	90	92	72
72	67	61	60	62	61	60	62	68	72	68	86	87	88	87	90
87	90	90	94	100	96	99	106	102	102	102	102	99	101	99	96

>EOF

ENTER LOG DATE (DD/MM/YR) : 19/07/79
ENTER SITE CODE (5 CHARS) : CC2C2
ENTER USER CODE (4 CHARS) : 7913
ENTER JOB CODE (3 CHARS) : 281

DATA LOGGED :19 JULY 1979
[illegible] : A-3C1/26
[illegible] : 1219
[illegible] : 60 DB
[illegible] : 64 DB
[illegible] : 4/60.0
[illegible] : 60 : 0

DATA ANALYZED : 14 SEPT 1979
SITE CODE : CC2C2
JOB CODE : 281
USER CODE : 7913
THRESHOLD : [illegible]
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

[illegible] CALCULATIONS
ARE BASED ON THE FOLLOWING:
[illegible]
[illegible] = [illegible]
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOUDNESS		SONE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	90.9	90.9	14.239	14.24
2	100.0	94.8	30.335	41.56
3	104.1	98.1	37.173	131.74
4	101.1	94.6	28.219	183.96
5	101.4	100.0	30.793	250.76
6	98.6	99.8	31.137	291.89
7	99.9	99.5	32.448	324.33
8	95.6	99.1	27.033	351.37

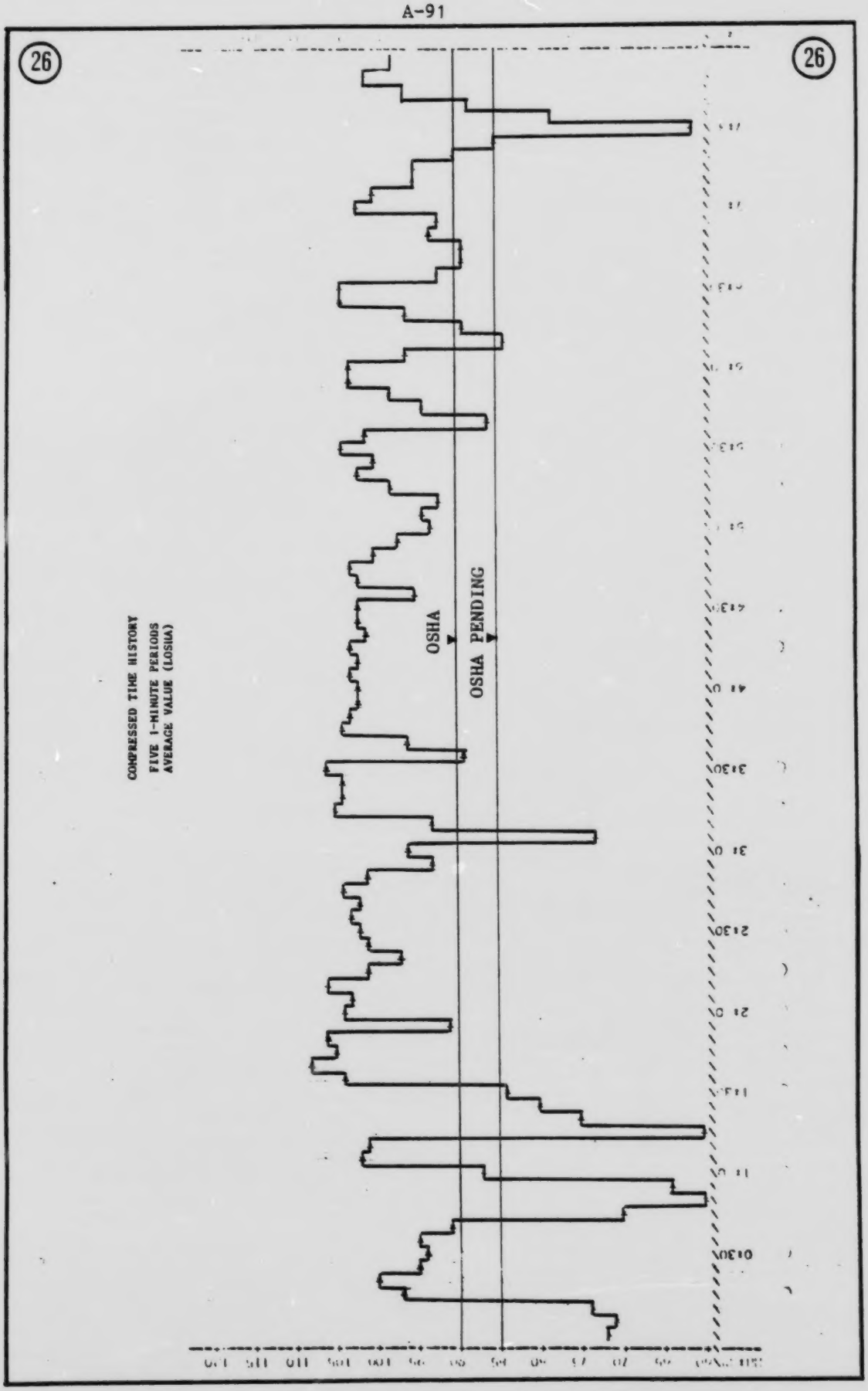
MIN. COMP. = 60 DB MAX. COMP. = 109 DB
ARITHMETIC MEAN = 92 DB
STD. DEVIATION = 13 DB
VARIANCE = 167 DB

(26)

FREQUENCY DISTPIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
38	7.9	60 TO 64
10	2.1	65 TO 69
19	4.0	70 TO 74
13	2.7	75 TO 79
17	3.5	80 TO 84
31	6.5	85 TO 89
66	13.8	90 TO 94
91	19.0	95 TO 99
135	28.1	100 TO 104
60	12.5	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

(26)


26
26
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0130
1 0
1130
2 0
2130
3 0
3130
4 0
4130
110
120
130

(27)

```
PLACE TAPE IN RECORDER DURING LYR* A *SPACE* AND A *FIGURE*
  1  26  65  1213   63   64    4    1
     195     115200  480
  69  73  62  61  60  61  65  61  62  60  60  60  76  78  75  74
  75  66  64  69  74  69  66  63  66  70  65  69  72  61  62  60
  65  60  60  63  61  72  65  61  75  91  93  79  79  60  60  60
  60  60  61  65  64  62  70  94  92  69  72  78  68  66  65  65
 101  99  95  96 100  97  95  96  91  98  95  96  95  62  66  60
  62  62  60  60  60  60  60  60  67  74  92  89  90  90  89  93
  96  92  92  93  90  90  90  96  95  97  91 100 104  93  92  92
  92  93  90  91  93  92  91  91  91  91  93  89  92  86  89  92
  63  63  68  69  89  97  87  84  90  93  92  95  94  94  95  96
  97  99  95  94  98  92  94  95  95  94  85  88  88  95  82  87
  84  87  86  78  86  84  82  82  85  84  84  83  84  84  89  95
  96  93  85  60  60  60  60  60  63  77  80  84  81  60  63  84
  84  84  86  89  96  83 105 110 115 111 113 107 114  95 109 107
  93  97  86 113 109 109 114 107 113 105 104 113 104  93  92  89
  87  88  87 106 112  96 114 111 112 107 111 112  87  99  85  99
  89  88 103 111  93  87  89  87  88  83  92  90  95  89  89  90
  87  90  90  90  89 110 112 111 112 111 112 108 100  82  82  92
  91  64  60  60  60  60  60  60  60  60  60  63  60  60  60  60
  60  60  60  60  60  60  60  64  60  63  62  60  65  67  60  66
  60  60  60  60  60  60  60  63  63  61  60  71  66  70  80  93
  85  81  80  80  80  79  80  80  80  80  80  80  81  68  80  84
  85  85  84  85  85  85 105 111 114 112 111 112 113 111 104  84
  82  83  85  88  90 110  81  80  80  80  80  81  80 104 113 104
  84  90 111 106 110 104  98  83  82  85  83  95 111 100 111 111
 110 110 107 112  83  89 101  84  85 107 109  95  93 109 113 109
 111 103 108 111  98  91  82  82  92  82  81  82  86  83  97  92
  82 110 106 107  98 110 104 113 111 112 110 113 107 109 111 106
  86  86  99 112 106 104  98  83  79  79  78  81  77  82  78  77
  83  79  84  92  91  71  76  68  67  75  80  73  71  86  88  85
  86  85  86  87  88  89  88  63  72  72  70  68  60  72  96  98
%EOF
```

(27)

```
ENTER LOG DATE (DD/MO/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC204
ENTER USER CODE (4 CHARS) : 4155
 ENTER JOB CODE (3 CHARS) : 010
```

```
   DATA LOGGED :12 JULY 1979          DATA ANALYZED : 12 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : CC204
SERIAL NUMBER : 1213                       JOB CODE : 010
     BASELINE : 60 DB                     USER CODE : 4155
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:48
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

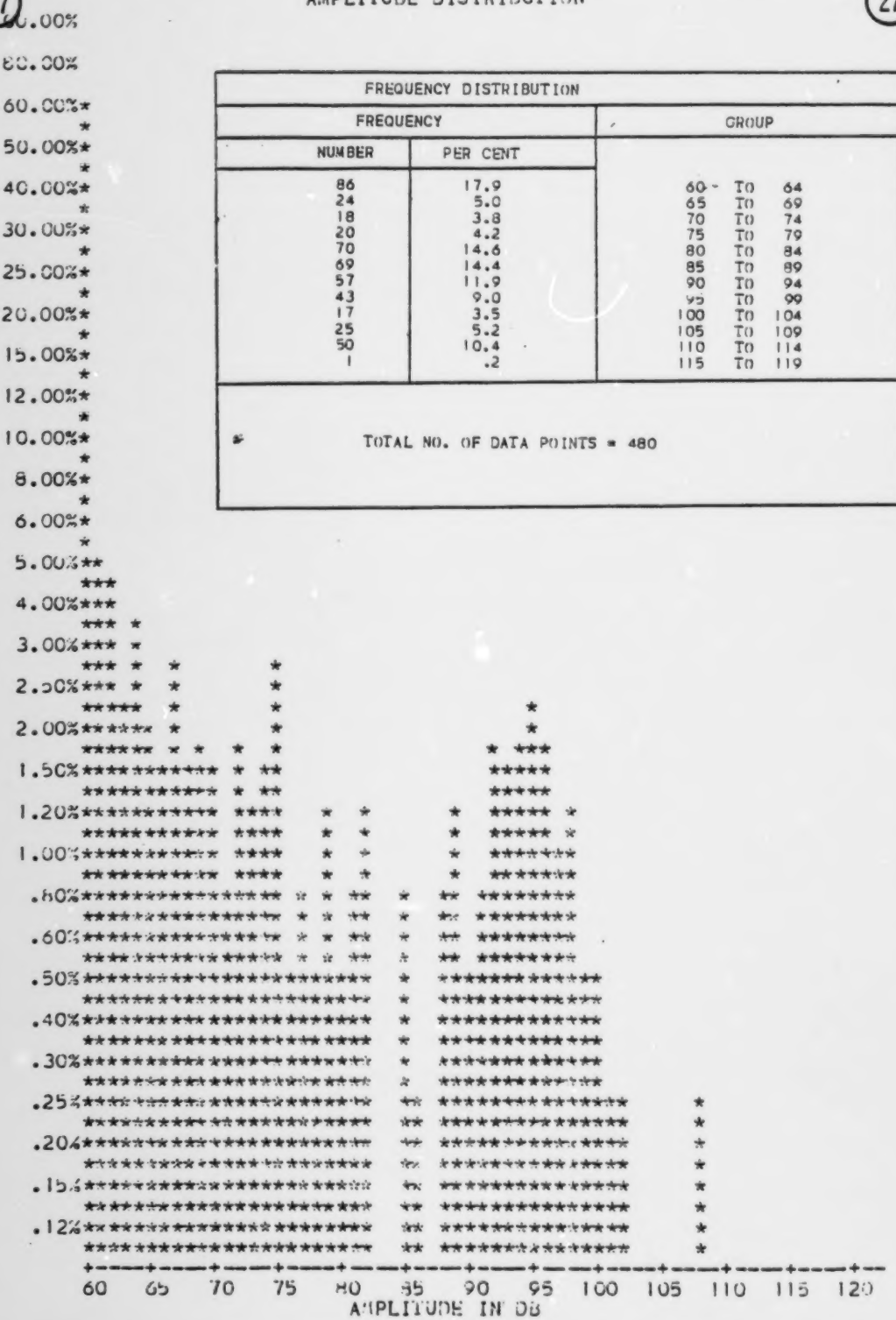
TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	75.2	75.2	1.602	1.60
2	92.5	86.1	17.586	19.19
3	90.8	89.1	14.045	33.24
4	105.4	97.3	105.150	138.39
5	97.8	97.4	36.970	175.36
6	98.5	97.6	40.385	215.74
7	103.9	98.9	85.375	301.12
8	100.2	99.1	51.190	352.31

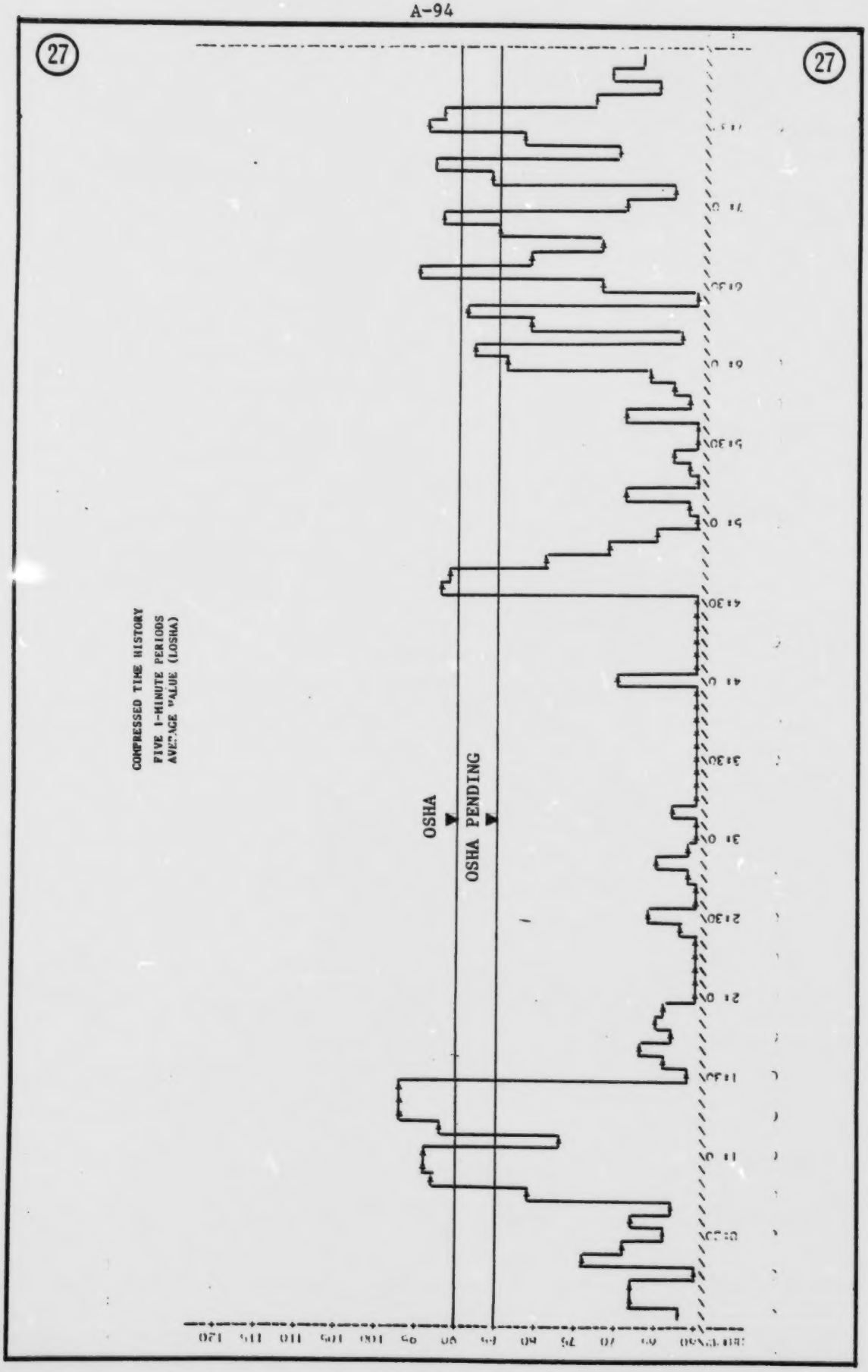
MIN. COMP. = 60 DB MAX. COMP. = 115 DB
ARITHMETIC MEAN = 85 DB
STD. DEVIATION = 16 DB
VARIANCE =256 DB

(27) AMPLITUDE DISTRIBUTION (27)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
86	17.9	60 To 64
24	5.0	65 To 69
18	3.8	70 To 74
20	4.2	75 To 79
70	14.6	80 To 84
69	14.4	85 To 89
57	11.9	90 To 94
43	9.0	95 To 99
17	3.5	100 To 104
25	5.2	105 To 109
50	10.4	110 To 114
1	.2	115 To 119

* TOTAL NO. OF DATA POINTS = 480




27
27
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
05
00
01:30
02:00
02:30
03:00
03:30
04:00
04:30
05:00
05:30
06:00
06:30
07:00

(28)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1213   60   64    4    1
     530     115200  480
  70  72  74  77  77  63  67  65  73  75  78  79  85  73  70  72
  72  72  60  62  66  71  76  83  74  79  86  88  89  93  99 100
  99 100  99  97  98  97  83  75  75  70  65  60  60  67  61  61
  60  60  65  63  72  83  77  73  82  96 100  89  81  81  81  82
  81  84  87  88  94  97  96  97  96  97  96  98  93  89  89 101
  96  94  90  89  89  92  91  92  91  92  89  92  96  93  94  94
 108 111 111 108 112 111 110 108 110 109 109 109 113 112 113 111
 96  91  91  92  94 107 110 112 112 109 104  91  90  99 102  97
 94 100 101 105 110 113 113 112 112 110 113 113 112 110 109 110
 112 113 110 107 111 107  94  89  88  86  89 103  97  94 100 110
 112 112 112 111 110 110 109 113 112 111 111 109 109 108 117 115
 111 107 107 107 107 113 113 112 112 112 111 111 112 112 112 113
 112 112 110 115 115 113 112 112 111 111 111 108  92 111 110 109
 108 108 107 105 113 110 110 109 108 109 107 110 114 113 112 111
 111 111 109 111 108 112 113 112 111 111 108 109 112 109 110 109
 108 107 114 114 113 112 112 111 109 112 113 112 112 110 111 109
 98  90  89  90  88  92  88  94  6   7   90  89  82  89  89  88
 88  88  98 100 113 114 114 113 111 109 112 112 111 112 114 112
 111 115 112 107 113 111 111 111 110 111 108  95  98  99  97  89
 102 100 101 112 112 111 110 110 110 109 112 109 109 109 111 110
 110 108 104 107 114 110 109 108 108 107 114 113 112 110 110 107
 104 103 112 110 111 105  93  93 105 110 109 109 103 101  96  97
 89  98 106 110 111 111 109 108 108 109 110 112 111 110 109 110
 103  97 101 101 102  92  96  91  96  98 103 103 102  99 101 112
 113 111 111 110 109 111 112 112 112 111 109 114 110 116 115 104
 100  96  90 105 102  90 101  93  89  89  90  91  91  91  88  89
 89  89  90  91  94 100  98  96 100  84  61  60  59  65  60  60
 60  60  64  60  68  65  69  62  60  60  79  77  67  73  71  64
 72  65  62  70  74  64  68  87  89  89  89  89  98  88  88
 88  91  89  91  93 102  98 100  99 100  95  79  72  85  82  72
%EOF
```

(28)

```
ENTER LOG DATE (DD/MM/YR) : 20/07/79
ENTER SITE CODE (5 CHARS) : 28205
ENTER USER CODE (4 CHARS)G: 1108

 ENTER JOB CODE (3 CHARS) : 281
```

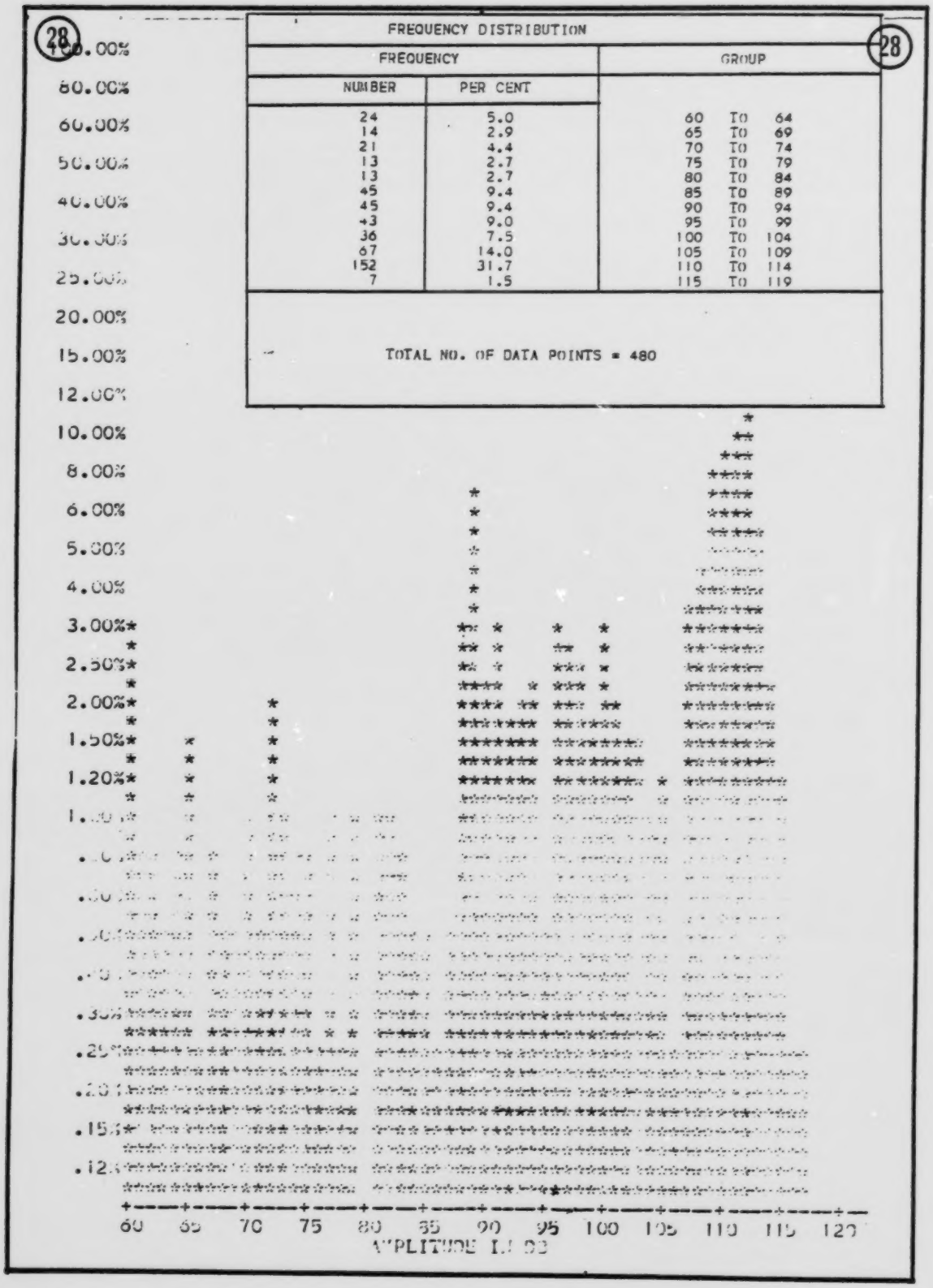
```
    DATA LOGGED :20 JULY 1979          DATA ANALYZED : 14 SEPT 1979
         LOGGER : DS-301/26                 SITE CODE : 28205
SERIAL NUMBER : 1213                        JOB CODE : 281
       BASELINE : 60 DB                     USER CODE : 1108
DYNAMIC RANGE : 54 DB                     THRESHOLD : 80 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 2:12
```

TIME HISTORY ANALYSIS

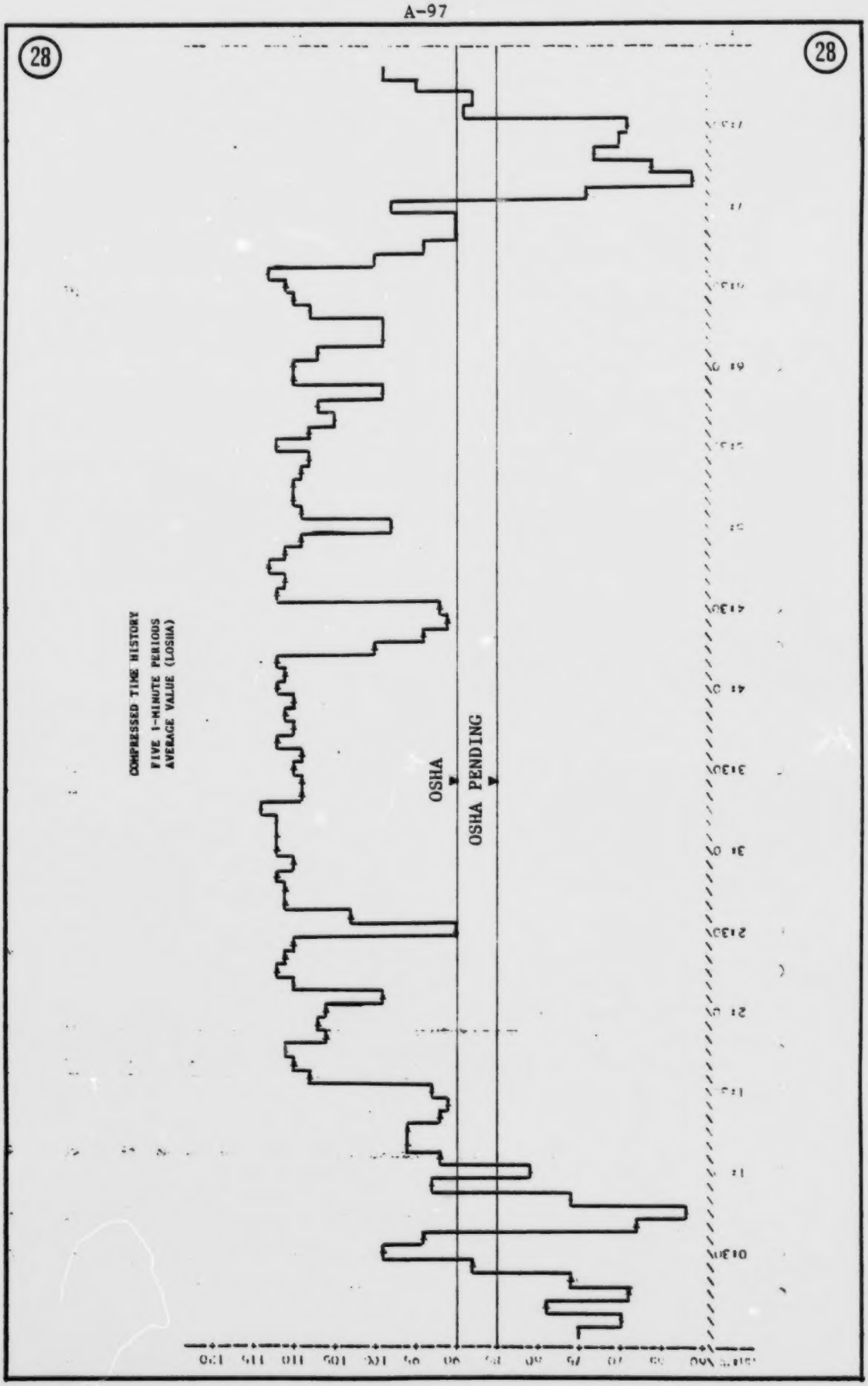
```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	87.6	87.6	8.920	8.92
2	103.4	99.1	79.655	88.57
3	106.9	104.0	171.349	259.92
4	110.9	106.4	226.038	485.96
5	108.9	107.0	171.076	657.04
6	108.1	107.2	153.464	810.50
7	106.3	107.0	119.014	929.52
8	89.1	106.2	10.968	940.48

```
MIN. COMP. =  60 DB                MAX. COMP. = 117 DB
ARITHMETIC MEAN =  97 DB
STD. DEVIATION =  15 DB
VARIANCE =225 DB
```



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
24	5.0	60 TO 64
14	2.9	65 TO 69
21	4.4	70 TO 74
13	2.7	75 TO 79
13	2.7	80 TO 84
45	9.4	85 TO 89
45	9.4	90 TO 94
43	9.0	95 TO 99
36	7.5	100 TO 104
67	14.0	105 TO 109
152	31.7	110 TO 114
7	1.5	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


28
28
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(29)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1213    60    64     4     1
     439      115200  480
  73  64  64  62  62  63  63  60  67  64  60  60  60  60  65  75
  60  60  61  60  60  70  70  63  60  60  61  60  60  62  60  60
  63  60  60  65  61  60  60  63  66  60  68  62  59  60  60  62
  61  65  73  76  77  66  62  64  67  69  89  90  90  90  89 100
 101  99 101 100 100 100 102 101  97  86  90  74  65  61  77  79
  84  91  94  87  87  93  95  94  76  94  91 103  97  90  90 100
  99  91  76  84  81  63  65  60  67  71  60  60  61  66  65  75
  60  70  76  62  81  76  92  81  67  67  98  94  91  98  97  99
 100  97  94  79  74  61  64  64  69  63  60  60  60  62  64  77
  74  61  65  60  61  87  85  89  90  97  94  95  96  85  96  96
  96  96 100  99  99  92  60  60  60  60  60  60  67  99  97  64
  73  72  60  64  60  60  93  62  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  91  93  97  99
  99  91  96  98  94  94  99  97  86  94  82  72  68  60  72  84
  77  66  84 101 101 102 102 104  74  90  90  93  92  94  90  84
  83  96  89 104  92  63  60  66  60  61  60  60  60  63  65  61
  62  61  69  60  61  60  60  67  60  60  76  72  60  62  63  62
  60  60  60  61  60  60  60  60  60  60  60  64  61  61  60  60
  61  61  60  60  61  60  60  61  62  79  63  60  67  73  60  60
  61  64  68  67  60  62  60  60  60  60  60  60  60  60  60  60
  72  67  74  89  96  87  90  88  86  83  88  85  86  90  88  96
  89  89  87  86  97  95  92  85  96  99  99  98  95  91  80  96
  91  68  64  83  88  90  87  85  85  84  85  85  84  89  81  65
  72  60  63  65  69  60  60  74  69  72  69  72  77  70  72  73
  71  62  67  64  60  62  73  66  65  78  84  67  60  61  60  61
  60  62  60  60  60  63  60  60  60  60  60  75  63  66  64  62
  60  77  60  62  60  60  60  60  61  68  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  62  60  60  60  67  60  60  70
  64  62  60  61  60  60  63  60  85  90  68  68  86  89  95  92
  92  93  92  94  91  73  62  60  64  63  75  73  68  74  63  75
EOF


ENTER LOG DATE (DD/MM/YR) : 23/07/79
ENTER SITE CODE (5 CHARS) : CC205
ENTER USER CODE (4 CHARS) : 4194
 ENTER JOB CODE (3 CHARS) : 271


   DATA LOGGED :23 JULY 1979          DATA ANALYZED : 17 SEPT 1979
        LOGGER : DS-301/26                 SITE CODE : CC205
 SERIAL NUMBER : 1213                       JOB CODE : 271
      BASELINE : 60 DB                     USER CODE : 4194
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC              TOTAL SAMPLES =  115200
 TEST DURATION =   8 H 0              STANDBY TIME =   01 1849

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

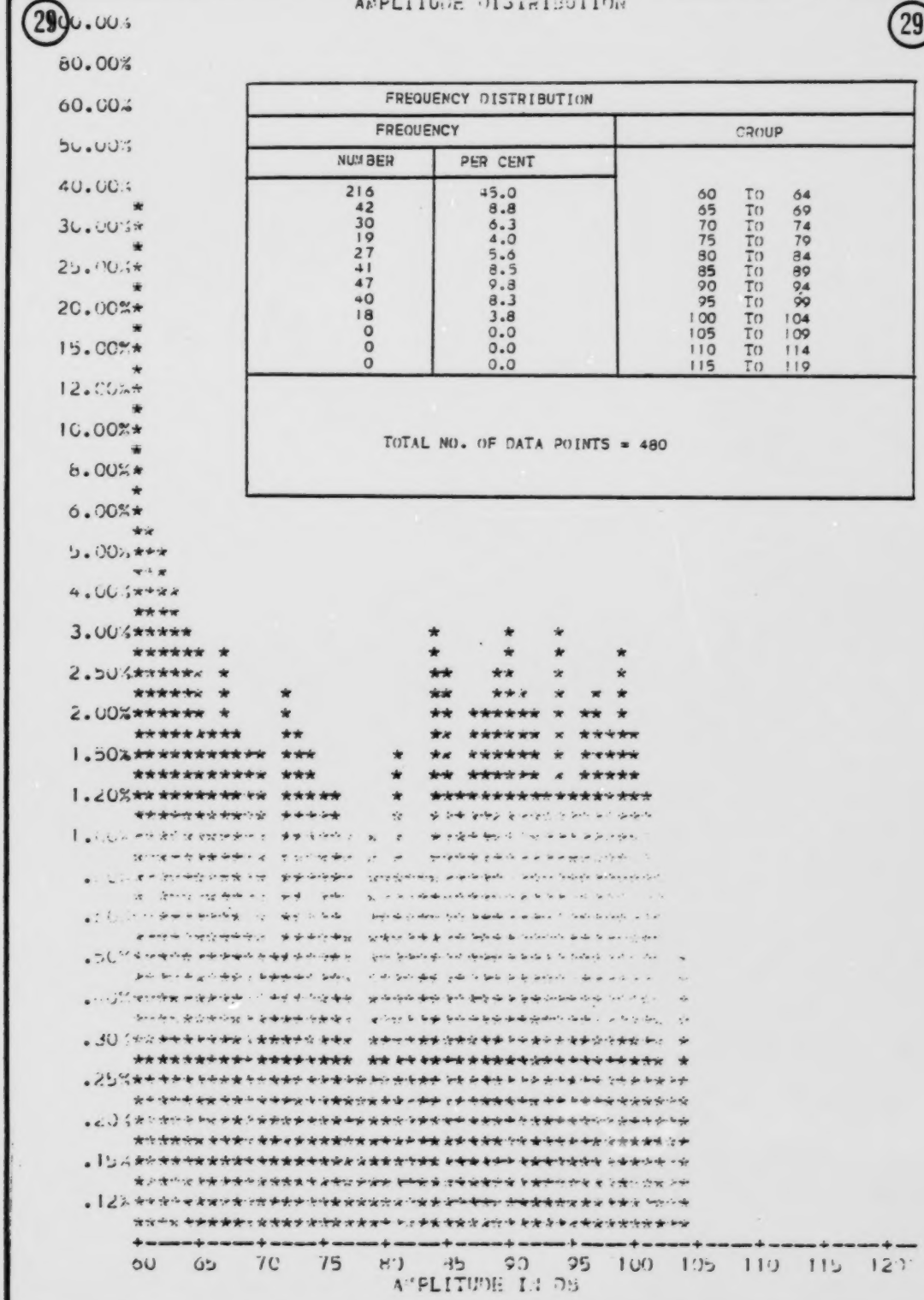
TIME          LOGIA                    DOSE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1        73.3        73.3        1.242        1.24
   2        92.4        87.9       17.493       18.73
   3        90.6        89.0       14.057       32.79
   4        91.2        89.6       14.760       47.57
   5        79.1        88.4        2.766       50.34
   6        87.9        88.4        9.195       59.73
   7        74.0        87.4        1.364       61.10
   8        80.7        86.8        3.425       64.52
MIN. COMP. =  60 DB              MAX. COMP. = 104 DB
ARITHMETIC MEAN =  73 DB
STD. DEVIATION =  14 DB
KURTOSIS =104.08
```

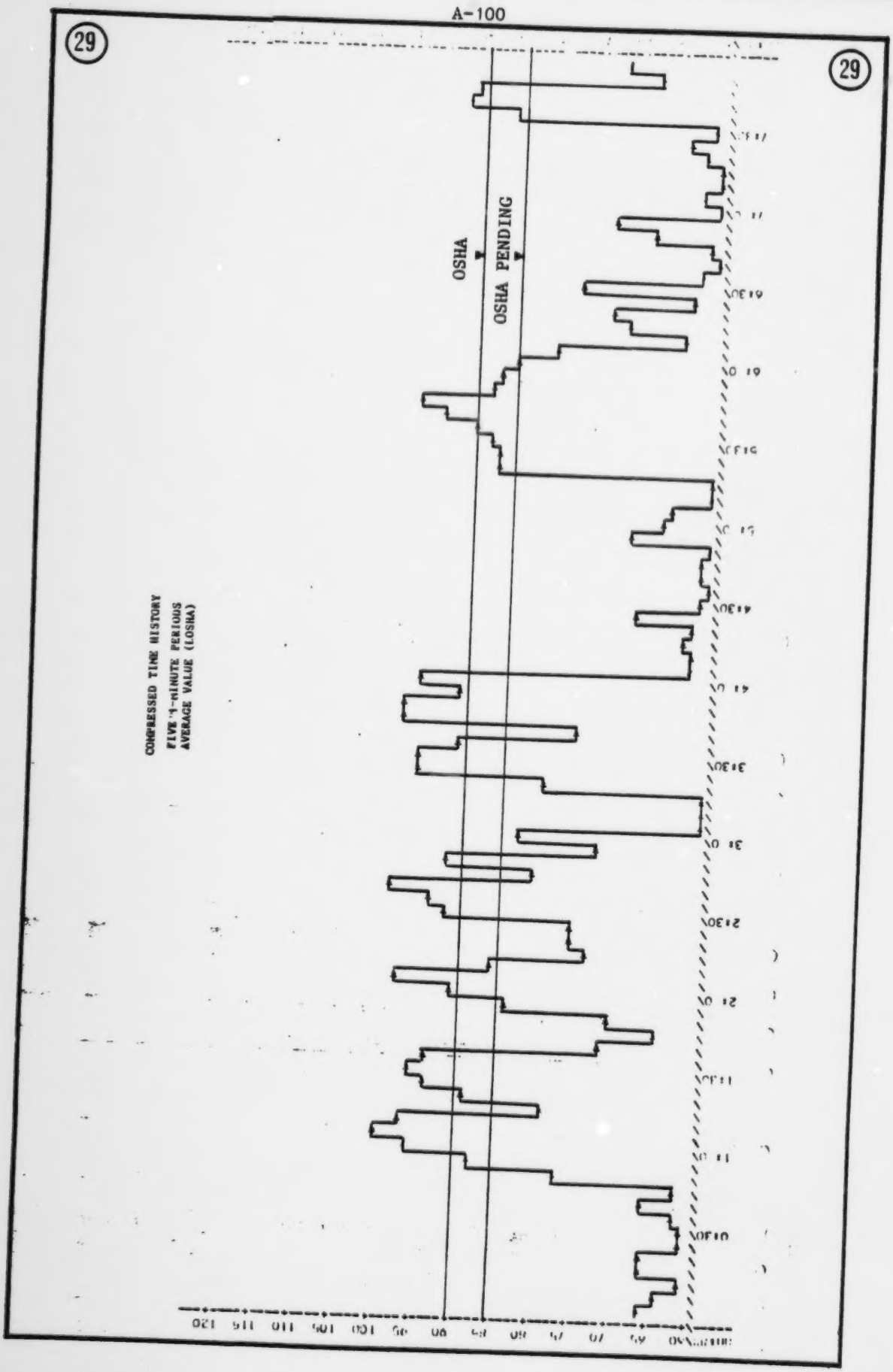
(29)

29 AMPLITUDE DISTRIBUTION 29

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
216	45.0	60 TO 64
42	8.8	65 TO 69
30	6.3	70 TO 74
19	4.0	75 TO 79
27	5.6	80 TO 84
41	8.5	85 TO 89
47	9.8	90 TO 94
40	8.3	95 TO 99
18	3.8	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




29
29
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(30)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1216   60   64    4    1
     491     115200  480
 61  60  60  60  62  60  60  61  60  60  60  61  60  60  60  62
 62  60  60  60  60  62  71  61  60  61  62  62  60  62  60  60
 61  60  60  61  69  60  67  60  67  60  60  60  60  62  62  66
 73  60  82  83  84  90  90  90  89  90  89  98 100  98  92 100
 99  99 101 100  95  86  60  75  60  84  77  82  83  72  94  84
 88  92  94  92  97  93  91 101  93  88  91  98  98  87  72  84
 76  63  61  60  70  61  60  60  60  61  66  74  60  75  71  65
 81  75  93  88  70  74  97  92  85  98  97  98  97  95  93  74
 76  77  87  77  86  62  60  60  61  60  63  70  70  90  61  60
 64  86  85  89  90  95  92  92  92  97  96  97  98  97 100 100
 97  79  60  60  60  60  60  60  61  60  60  71  78  80  60  60
 60  60  60  60  60  60  65  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  80  92  94  97  97  95  90  96  95
 90  95  96  92  84  89  84  70  60  60  60  60  61  89  89  96
 96  95  96  97  93  98  92  87  86  85  85  86  80  82  82  85
 87  85  90  73  62  65  65  60  60  62  60  60  61  60  60  60
 61  63  61  63  63  64  62  63  60  60  60  60  60  60  63  60
 60  60  66  60  60  60  60  60  60  62  60  60  60  60  61  60
 62  62  60  60  60  64  60  65  71  66  66  61  60  60  60  60
 61  63  61  60  60  60  60  66  60  60  60  60  60  60  61  60
 65  87  89  89  89  72  85  84  85  85  87  87  86  89  86  86
 87  89  99  97  90  82  66  96  92  95  98  92  94  77  93  93
 60  60  60  84  86  85  85  85  85  85  85  85  86  85  60  61
 60  60  60  60  60  60  60  60  60  75  60  60  60  60  60  60
 60  60  60  60  60  61  60  60  59  85  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  46  72  64  76
 79  60  61  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  61  60  60  60  60  60  60
 60  60  60  60  60  60  73  69  88  86  87  88  89  94  92  92  92
 92  91  93  92  77  61  64  60  62  61  67  61  63  60  66  78
%EOF
```

(30)

```
ENTER LOG DATE (DD/MM/YR) : 23/07/79
ENTER SITE CODE (5 CHARS) : CC205

ENTER USER CODE (4 CHARS) : 4350

 ENTER JOB CODE (3 CHARS) : 272
```

DATA LOGGED :23 JULY 1979
LOGGER : TM-3C1/26
SERIAL NUMBER : 1216
BASELINE : 60 DL
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 17 SEPT 1979
SITE CODE : CC205
JOB CODE : 272
USER CODE : 4350
THRESHOLD : 60 DL
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 23: 2

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DL
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

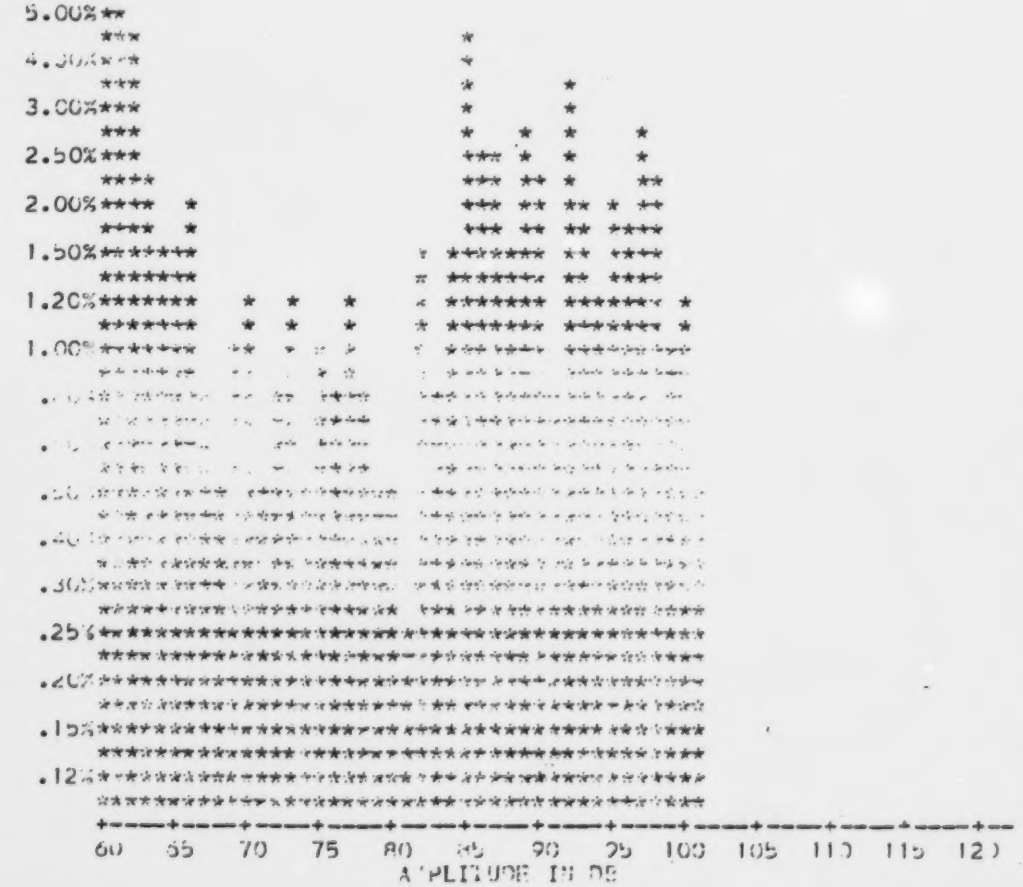
TIME	LOGA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	78.0	78.0	2.360	2.36
2	91.1	87.2	14.412	16.77
3	88.4	87.6	9.664	26.43
4	88.2	87.8	9.757	36.19
5	69.3	86.3	.708	36.90
6	86.4	86.3	7.625	44.52
7	72.1	85.4	1.039	45.56
8	77.9	84.9	3.075	48.64

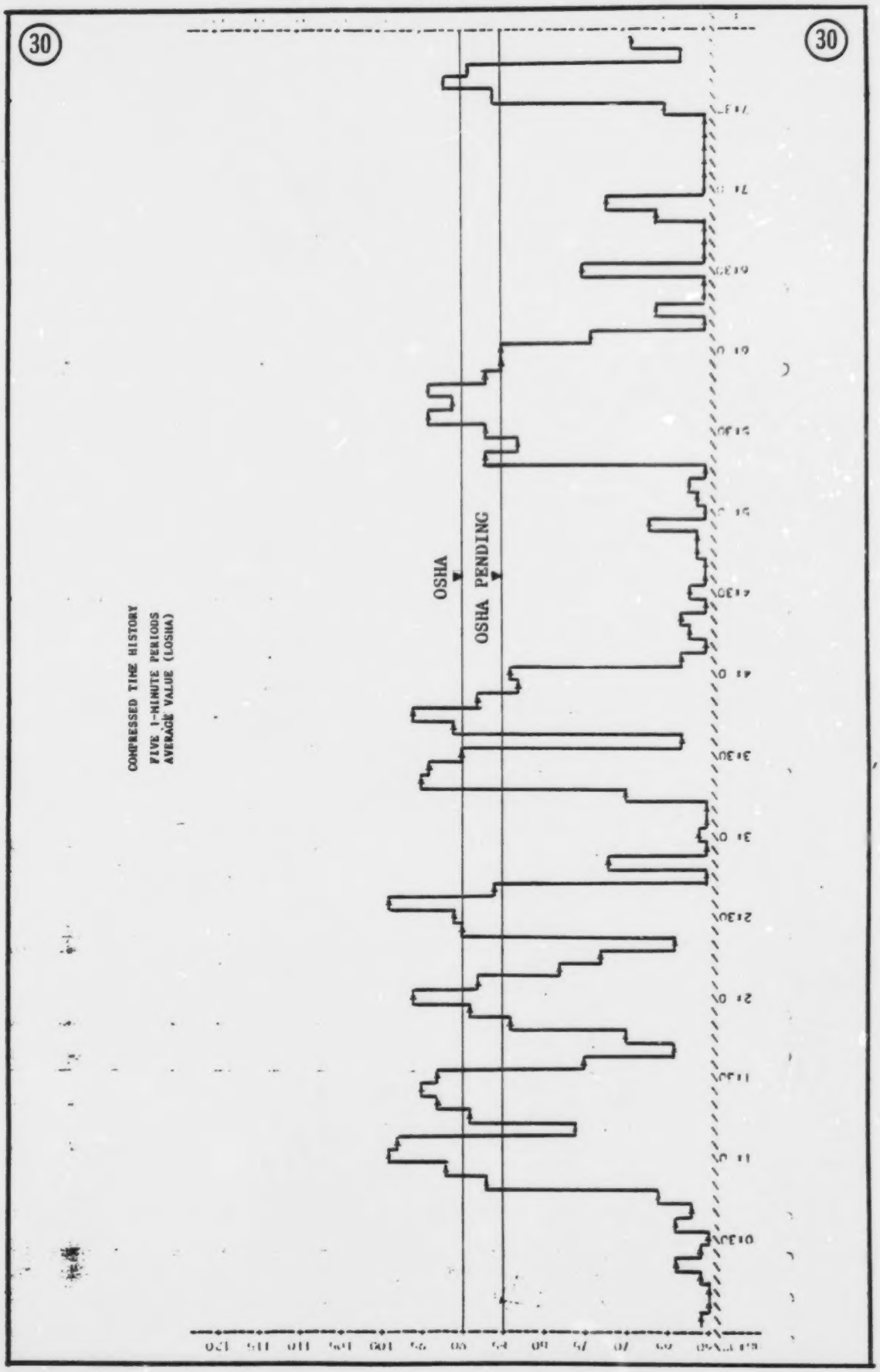
MIN. COMP. = 60 DB
MAX. COMP. = 101 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 14 DB
VARIANCE =196 DB

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
264	55.0	60 TO 64
23	4.8	65 TO 69
17	3.5	70 TO 74
17	3.5	75 TO 79
18	3.8	80 TO 84
55	11.5	85 TO 89
40	8.3	90 TO 94
39	8.1	95 TO 99
7	1.5	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




30
30
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(31)

```
PLACE TAPE IN READER FILE TYPE A "BINARY" AND A "RETURN"
  1  26  39  1225   60   64    4    1
     160     115200  600
  61  60  62  60  60  60  60  60  66  66  77  64  62  60  69  72
  63  63  60  60  62  78  79  78  77  77  68  71  71  74  72  71
  62  60  60  60  62  63  64  60  60  60  60  60  59  63  70  69
  62  83  95  96  95  96  96  97  97  98  96  96  95  98 100 103
  99  98  97  98  97  97  99  99  93  98  71  69  60  60  61  60
  61  60  60  61  60  64  60  61  61  60  60  64  62  60  60  60
  60  62  60  60  73  72  60  60  61  60  74  60  60  61  62  73
  67  73  60  63  69  62  60  65  63  61  60  63  60  61  60  60
  67  65  63  63  62  60  62  72  65  65  73  74  69  72  74  77
  80  80  81  83  82  88  84  86  82  83  88  89  89  90  89  88
  89  92  90  81  82  84  77  77  81  88  90  86  82  44  89  89
  82  80  85  83  73  60  60  72  87  60  72  74  91  95  90  80
  78  69  60  60  60  60  60  60  60  60  87  66  84  80  60  60
  60  86  99  85  60  60  60  65  72  60  60  60  91  80  67  97
  77  62  60  61  62  60  60  60  60  66  60  60  60  61  67  94
  78  62  71  64  67  67  63  96  94  98  93  74  67  90  86  84
  66  60  60  60  60  60  77  86  87  88  88  87  87  87  87  87
  89 100  89  89  91  97  89  71  65  75  72  68  61  60  60  64
  62  67  62  70  68  72  73  62  62  70  74  66  69  68  61  65
  64  72  78  77  75  67  72  71  65  74  68  66  63  64  64  62
  66  75  79  71  73  65  69  76  74  77  65  68  70  75  80  92
  89  66  92  90  90  90  90  89  90  87  91  92  95  94  93  92
  87  80  80  80  80  82  86  86  88  89  89  98  89  90  92  89
  89  91  88  88  88  88  89  91  88  88  88  88  89  89  88  88
  90  87  88  85  86  87  86  86  88  91  84  89  89  60  60  75
  70  72  85  90  88  92  88  86  89  89  90  91  86  90  90  89
  90  92  86  88  90  91  92  90  90  87  87  90  89  86  60  79
  61  60  77  61  70  71  66  60  60  91  84  83  80  81  85  84
  80  78  79  80  80  80  83  84  82  83  84  86  81  80  79  81
  84  80  84  79  81  88  89  88  75  68  73  73  96  91  75  73
$EOF


ENTER LOG DATE (DD/MM/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4069

 ENTER JOB CODE (3 CHARS) : 281
```

(31)

```
   DATA LOGGED :12 JULY 1979          DATA ANALYZED : 12 SEPT 1979
        LOGGER : DI-3000/26               SITE CODE : CC210
 SERIAL NUMBER : 1225                      JOB CODE : 281
      BASELINE : 60 DB                    USER CODE : 4069
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE : 4/SEC               TOTAL SAMPLES = 115200
 TEST DURATION = 8 HRS 0 MIN           STANDBY TIME = 0 HRS 0 MIN

            TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

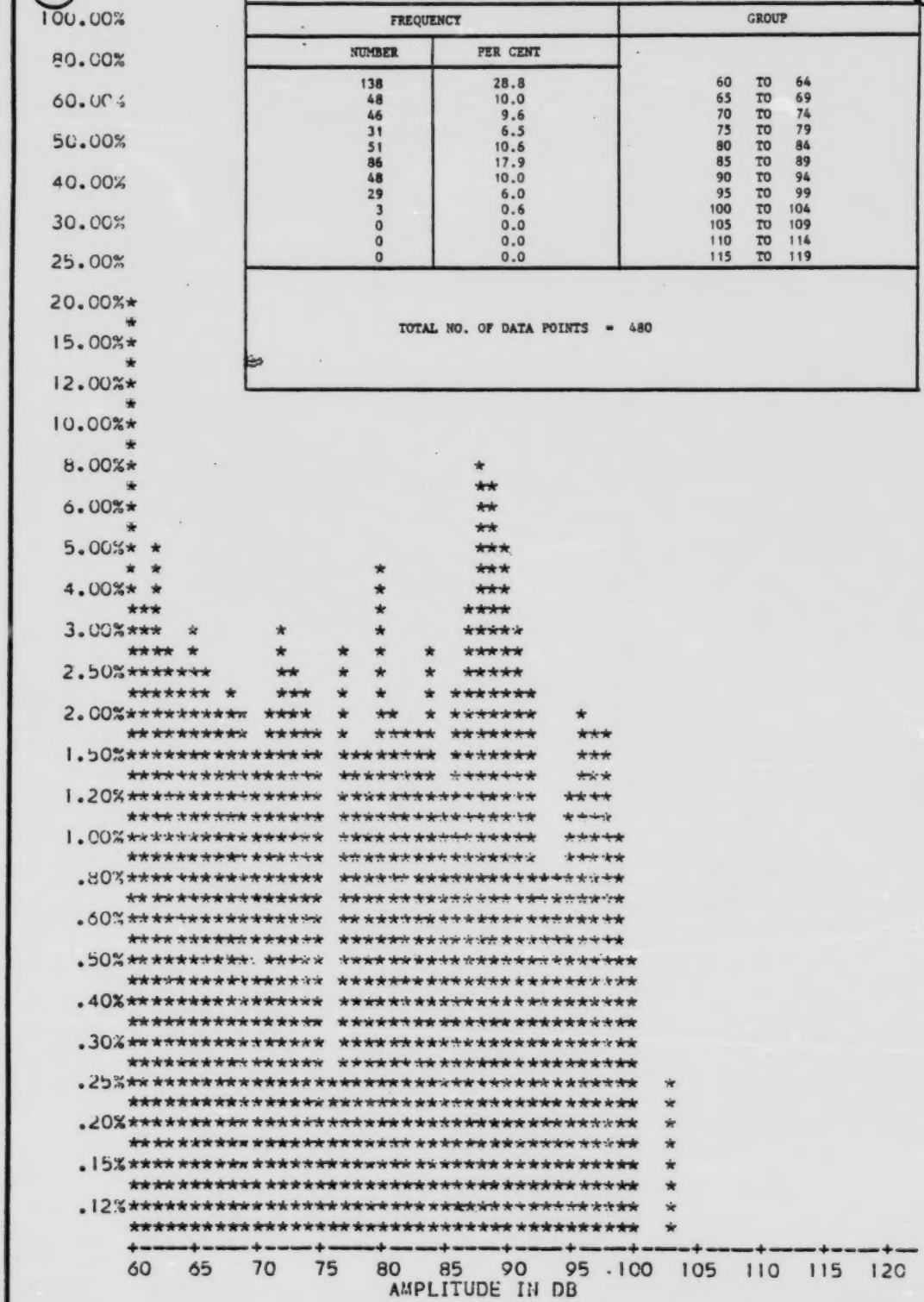
TIME          OSHA                    NOISE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1       84.1       84.1        5.553        5.55
   2       85.2       86.4        9.692       15.25
   3       82.5       85.3        4.433       19.68
   4       81.7       84.6        3.941       23.62
   5       85.5       84.8        6.677       30.30
   6       83.7       84.6        5.225       35.52
   7       85.5       85.3       10.187       45.71
   8       84.0       85.2        5.434       51.14
MIN. COMP. =  80 DB              MAX. COMP. = 101 DB
ARITHMETIC MEAN =  76.09
STD. DEVIATION =  13.93
VARIANCE =194.0 DB
```

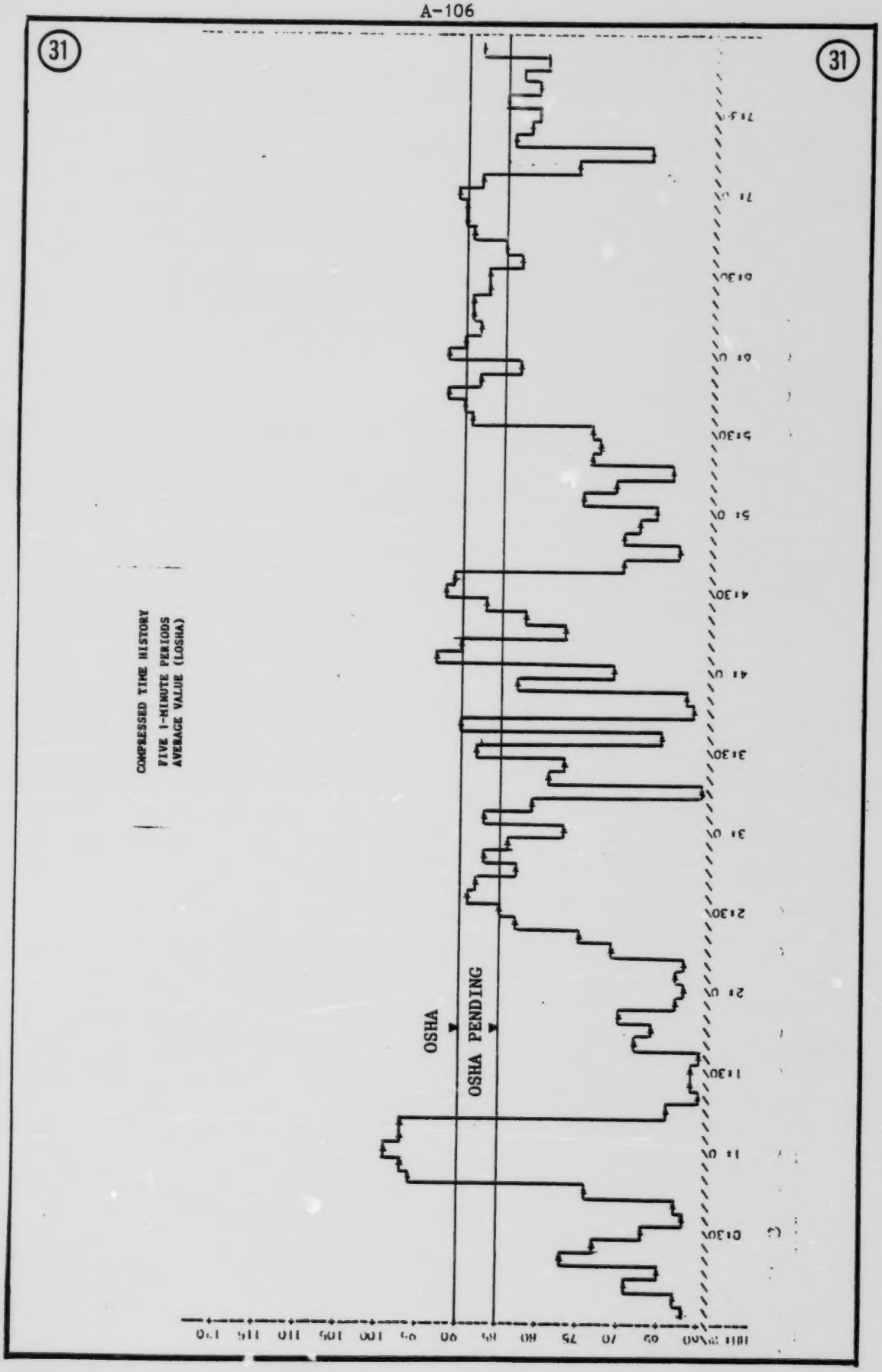
(31)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
138	28.8	60 TO 64
48	10.0	65 TO 69
46	9.6	70 TO 74
31	6.5	75 TO 79
51	10.6	80 TO 84
86	17.9	85 TO 89
48	10.0	90 TO 94
29	6.0	95 TO 99
3	0.6	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

(31)




31
31
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dBA
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(32)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  60  1219   60   64    4    1
      50     115200   4.0
  64  60  60  60  60  65  61  60  60  62  60  63  61  60  60  71
  60  70  72  73  61  70  70  62  64  62  64  71  73  72  73  73
  69  72  73  69  90  89  92 101 100 101 102 101  99 102 101 105
  97  72  87  82 101 101  91  91  91  91  93  99 102 100  96 101
  94 101 103  95  96  96  95  94  91  94  85  85  86  83  90  95
  92  90  93  90  92  90  91  90  93  94 100  97  96  95  95 100
 105 104 104  96  93 103 102 102 104 103  95 104  94 103 103  97
 104 104 101 104 104  99  99 102 102 103 103  99  95  95  97 102
 100 102 102 102  97  97  87  94 104 105 105 101 105  98  95  95
  95  96  97 102 106 105 104 105 102  99  98  72  78  73  70  67
  66  60  60  62  71  70  60  62  76  71  72  89  96 104 104  85
  97  92  86  83  84  87  90  86  83  93  99  94  93 100 105 107
 104  98  92  95  81  74  80  83  81  85  91  84  75  81  84  98
  82  82  79  83  80  85  89  84  84  94  91  82  87  78   7  89
  79  69  80  69  64  70  88  87  85  87  88  86  87  85  90  98
  89  88  89  89  83  88  86  86  84  82  91  79  77  76  82  76
  77  84  82  74  79  74  80  81  78  86  93  91  75  76  75  69
  69  68  60  60  61  60  60  60  65  60  67  72  63  63  61  60
  63  62  71  60  60  60  60  61  61  60  62  60  64  60  60  61
  69  72  67  62  77  81  93  91  81  81  77  78  78  79  83  81
  84  82  81  80  80  82  80  80  82  81  80  80  80  80  83  80
  80  80  80  82  81  79  80  80  81  80  81  80  80  80  83  81
  81  80  80  81  80  81  80  99 104  97 104 104 103 104  99  96
  86  86  86  86  86  86  87  87  86  99 104 104 104 104 104 104
 101  85  87  86  85  85  85  85  86  85  85  85  87  85  85  85
  85  85  86  85  86  86  85  86  86  86  95 104 105  87  85  86
  83  84  84  86  87  85  77  79  75  80  79  77  74  74  76  77
  78  77  85  86  82  85  85  85  84  87  83  82  79  78  78  83
  85  77  91  88  73  75  69  78  75  74  75  79  68  74  84  98
  90  96 101  96  94  93  96  85  90  69  60  83  73  95  86  86
%EOF
```

(32)

```
ENTER LOG DATE (DD/MM/YR) : 13/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4155

 ENTER JOB CODE (3 CHARS) : 010
```

```
   DATA LOGGED :13 JULY 1979          DATA ANALYZED : 12 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : CC210
SERIAL NUMBER : 1219                       JOB CODE : 010
     BASELINE : 60 DB                     USER CODE : 4155
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC             TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0           STANDBY TIME =   0: 0:12
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

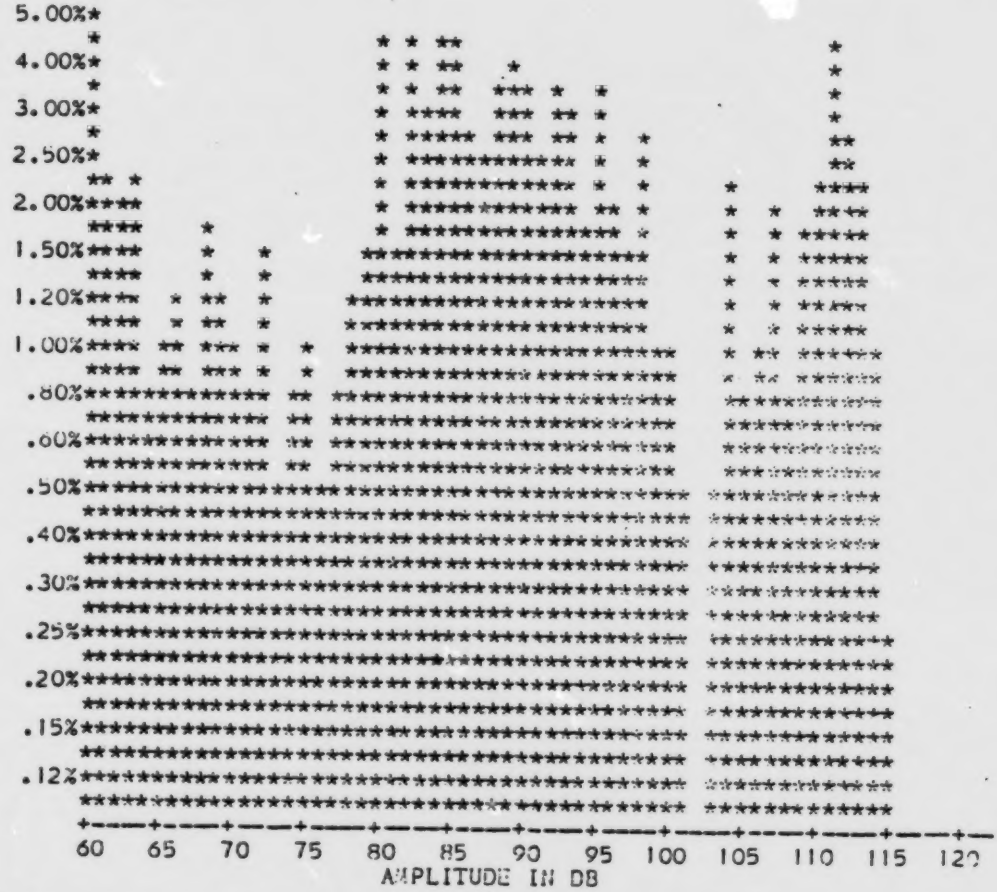
TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	91.1	91.1	14.475	14.47
2	98.7	95.9	41.903	56.38
3	97.9	96.6	37.258	93.64
4	90.3	95.5	13.112	106.75
5	79.9	94.1	3.076	109.82
6	81.9	93.0	4.075	113.90
7	95.6	93.4	27.033	140.93
8	86.6	92.9	7.754	148.68

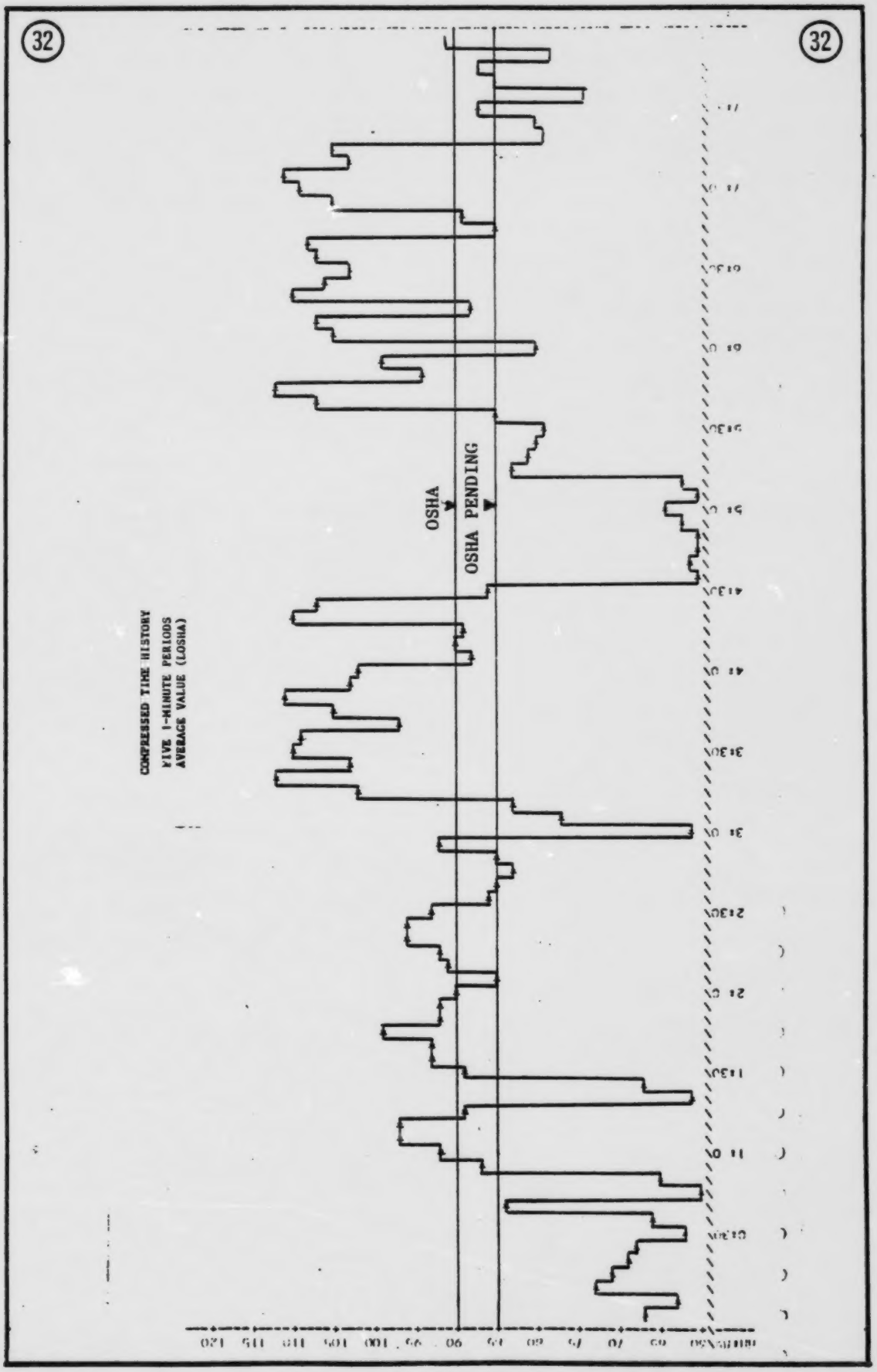
MIN. COMP. = 60 DB MAX. COMP. = 107 DB
ARITHMETIC MEAN = 84 DB
STD. DEVIATION = 13 DB
VARIANCE = 169 DB

(32) AMPLITUDE DISTRIBUTION (32)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
57	11.9	60 To 64
18	3.8	65 To 69
29	6.0	70 To 74
44	9.2	75 To 79
87	18.1	80 To 84
87	18.1	85 To 89
39	8.1	90 To 94
45	9.4	95 To 99
64	13.3	100 To 104
10	2.1	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




32
32
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
DECIBELS

(33)

PLACE DATA IN MEMORY TYPE A "NUMBER" AND A "RETURN"
1 20 60 122 63 64 4 1
94 115200 480)

65	60	60	60	71	60	65	60	60	74	77	63	77	73	76	69
73	74	73	67	76	67	70	79	76	79	85	91	90	92	91	91
91	96	97	96	97	98	96	97	98	94	97	86	73	71	72	60
65	68	60	60	67	67	62	76	63	82	75	77	75	79	82	63
60	74	69	82	82	78	71	62	60	66	75	62	76	68	69	78
75	75	73	74	71	69	90	98	89	90	87	95	103	97	93	105
103	105	105	103	107	106	109	108	107	107	100	83	66	86	90	103
108	108	107	107	105	106	108	107	108	107	108	97	80	80	82	69
69	64	72	66	72	66	62	75	63	71	83	85	70	60	67	63
70	60	65	60	63	69	75	76	77	81	86	86	73	62	71	66
71	73	75	78	90	98	97	101	98	99	100	100	97	99	100	99
95	91	92	88	89	89	88	89	83	88	89	88	89	89	88	90
91	90	92	96	94	95	94	93	97	95	100	102	94	93	95	96
95	95	96	97	96	93	96	96	93	93	93	96	94	94	94	93
95	94	96	96	94	92	90	91	93	92	92	93	91	91	89	88
89	85	90	89	93	96	95	97	96	98	99	98	99	100	98	97
95	94	95	95	94	93	94	99	89	56	74	71	62	60	60	61
60	60	60	63	61	66	71	63	62	61	62	61	69	63	60	60
60	60	61	60	61	60	62	60	60	60	62	72	67	60	63	69
66	60	71	70	72	84	90	96	97	82	85	93	96	99	92	92
92	93	93	87	93	93	94	96	96	90	89	93	91	93	91	92
98	94	96	94	93	94	92	93	84	96	100	92	90	92	106	105
95	93	101	105	106	104	102	105	104	101	101	105	106	102	93	94
103	106	106	105	105	103	101	105	105	102	92	95	103	106	105	105
105	101	103	104	105	103	96	94	103	106	106	103	106	104	101	105
103	105	99	100	94	93	104	104	106	104	106	103	100	104	106	105
96	90	98	105	106	105	103	105	101	100	105	105	104	95	93	102
105	100	103	99	101	95	80	76	77	76	82	74	71	83	84	74
78	75	70	86	72	79	89	80	75	93	96	88	96	101	101	100
101	95	74	91	73	78	82	83	95	85	93	95	88	73	83	90

%EOF

(33)

ENTER LOG DATE (DD/MM/YR) : 13/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4089

ENTER JOB CODE (3 CHARS) : 281

DATA LOGGED :13 JULY 1979
LOGGER : SD-301/26
SERIAL NUMBER : 1224
BASELINE : 60 DB
DYNAMIC RANGE : 94 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 12 SEPT 1979
SITE CODE : CC210
JOB CODE : 281
USER CODE : 4089
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0:23

TIME HISTORY ANALYSIS

NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

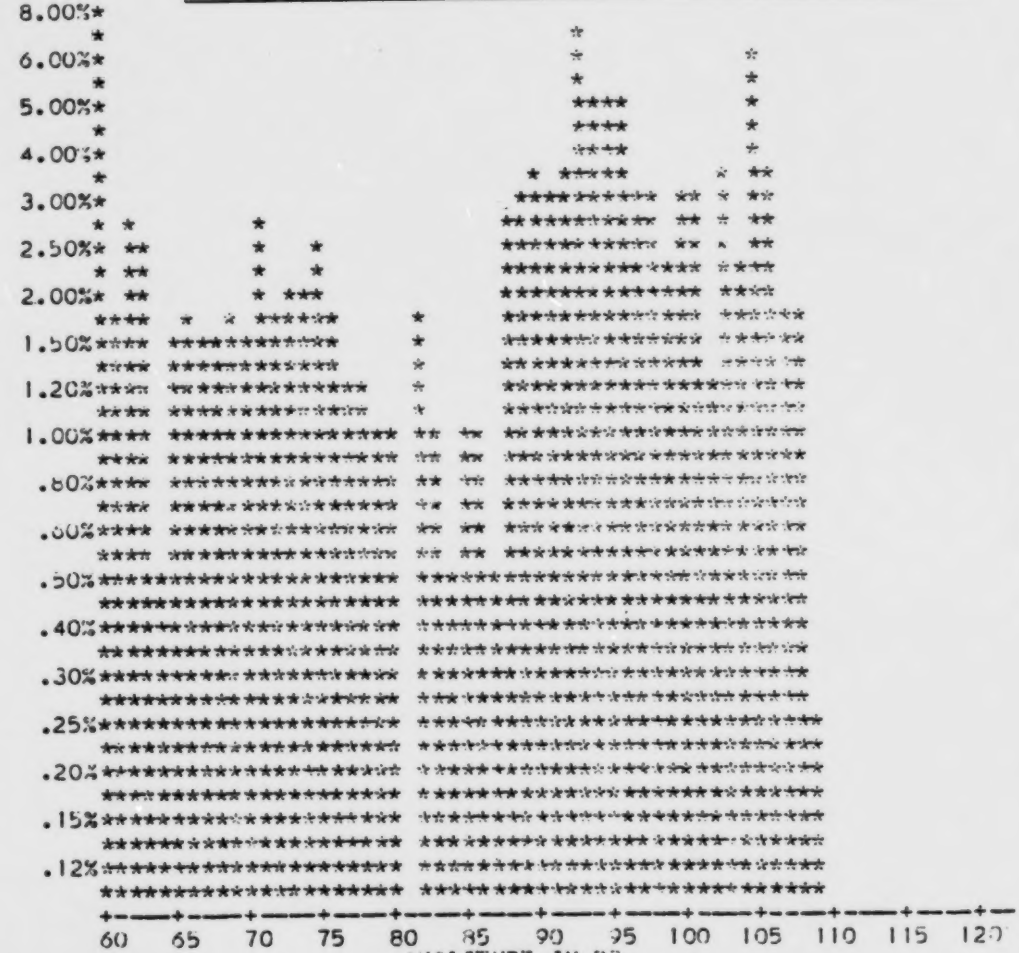
TIME HOUR	LOUDA CURRENT	LOUDA CUMULATIVE	DOSE CURRENT	DOSE CUMULATIV
1	89.6	85.6	1.787	1.79
2	99.5	95.6	46.497	54.24
3	92.6	94.7	17.897	72.14
4	93.6	94.4	20.483	92.62
5	89.6	93.7	11.723	104.35
6	95.5	94.0	26.910	131.26
7	103.3	95.2	75.922	207.1
8	96.1	95.2	29.343	436.22

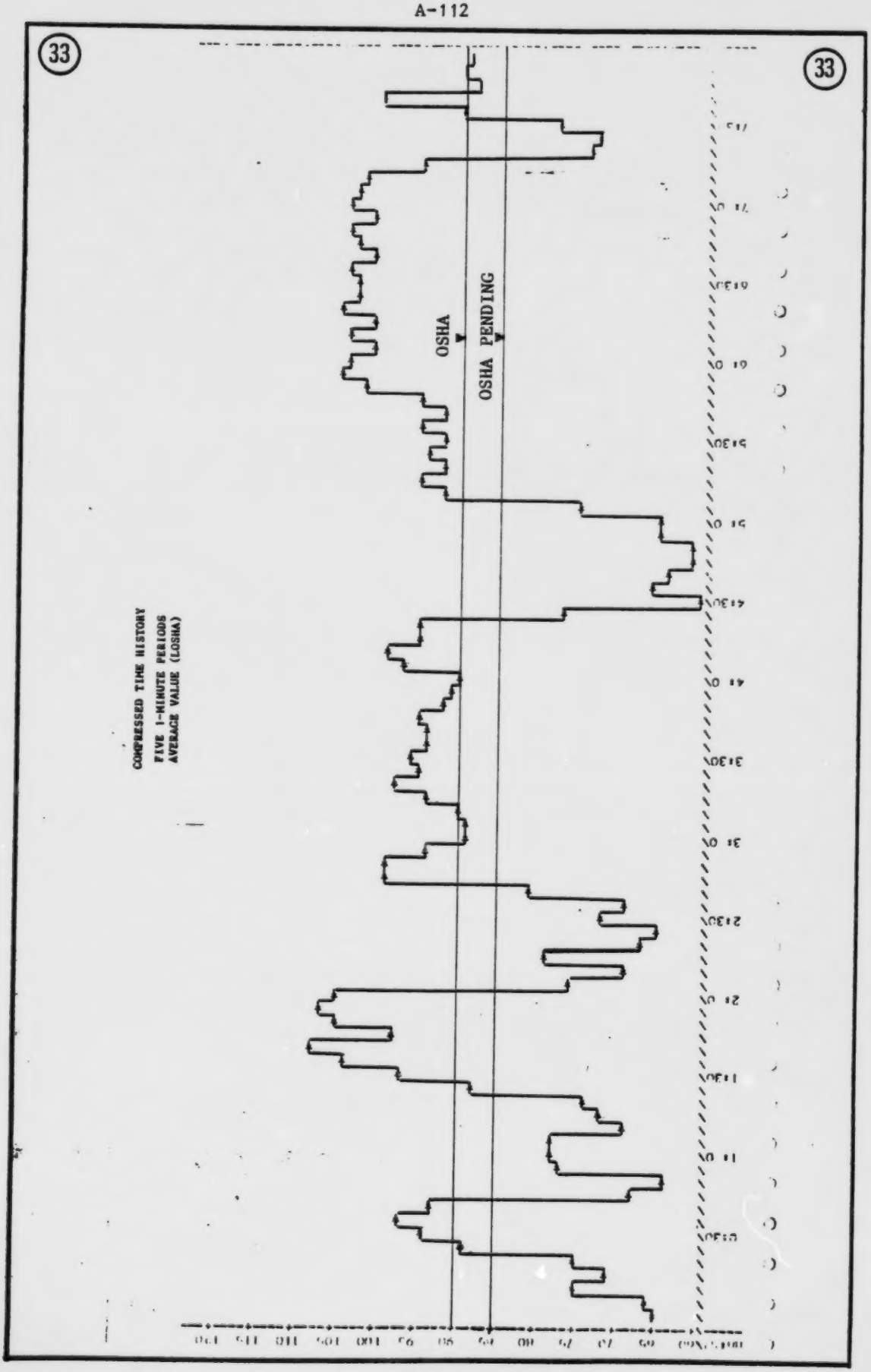
MIN. COMP. = 60 DB
MAX. COMP. = 109 DB
ARITHMETIC MEAN = 95.05
STD. DEVIATION = 10.87
VARIANCE = 118.22

(33) AMPLITUDE DISTRIBUTION (33)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
60	12.5	60 TO 64
32	6.7	65 TO 69
40	8.3	70 TO 74
31	6.5	75 TO 79
17	3.5	80 TO 84
33	6.9	85 TO 89
86	17.9	90 TO 94
74	15.4	95 TO 99
53	11.0	100 TO 104
54	11.3	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




33
33
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(34)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(34)

```
  1  26  80  1213    60    64    4    1
     240     115200  480
 61  62  60  60  60  61  60  61  60  60  70  63  60  60  60  64
 60  62  61  60  60  60  60  60  61  60  60  63  67  75  80  80
 81  90  94  92  92  90  91  91  90  90  93 101 100 101 100 100
101  95  95  95  91  90  60  60  60  60  60  60  60  60  60  60
 87  93  88  86  86  86  87  89  97  90  95  97  94  93  90  92
100  99 100 101 101 100  99  96  97  87  70  77  95  86  87  86
 70  75  83  85  84  81  60  60  72  89  97  86  94  93 112 109
 95  97  93  80  69  79  66  67  66  60  61  60  62  63  64  67
 89  94 102 107 107 104 101 109 109 108 108  95 106 109 106  96
102 107 107 101  95  92  91  93  96  95  94  91  92  92  90  93
 95  95  93  95  95  92  91 108 110 109 109 100 102 102 111 110
109 106  90  95  90  93  96  94  87  87  87  87  87  88  95 110
110 109 109 102  89  91 106 111 111 110 109 101 112 111 110 110
106  91  93  93  90  94  91 106 111 103 101 110 109  87  88  89
 88  89  88  79  79  89  88  95 106 111 111  96  87  86  86  89
 89  87  88  88  89  89  89  90 107 108  91  91  90  96  92 107
111 109 109 107  92  91  92  91  92  93  93  93  92  98 112 110
110 109  99  91 112  92  79  80  91  92 100  75  64  60  60  64
 63  60  73  60  63  60  60  60  60  60  60  60  60  60  61  70
 72  60  60  60  60  71  63  64  74  95  94  89  86  87  74  75
 92 111 111 108  88  80  81  84  84  88  80  88  90  89  89  88
 89  90  90  89  89  89  89  92  90 106 111 110 108 108 102  88
107 107  95 109 111 109 109  94 108 112 111 109 108  92  88  88
 86  88  89  89  88  90  91  88  89  89 111 102 111  97  89 110
103  88  89  88  88 112 113 112  91 107 112 111 110  90  90  89
 89  89 108 113 112 111 106 111 111 109 110  95  88  87  89  90
 89 109 111 110 108  89  90 112 111 111 100  93  92  94  94  92
 95  91  91  90  92  91  91  94  87  79  86  86  76  84  80  86
 80  83  84  85  80  81  81  91  94  97  92  80  80  82  80  73
 65  86  75  73  78  88  80  88  71  74  75  73  75  75  74  82
$EOF


ENTER LOG DATE (DD/MM/YR) : 16/07/79

ENTER SITE CODE (5 CHARS) : CC210

ENTER USER CODE (4 CHARS) :
 ENTER JOB CODE (3 CHARS) : 214

   DATA LOGGED :16 JULY 1979          DATA ANALYZED : 13 SEPT 1979
        LOGGER : 05-301/26                 SITE CODE : CC210
 SERIAL NUMBER : 1213                       JOB CODE : 214
      BASELINE : 60 DB                    USER CODE : 4635
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
 SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
 TEST DURATION = 480 MIN 0            SEASONS TIME = 08 11 0

          TIME HISTORY ANALYSIS

 NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
 ARE BASED ON THE FOLLOWING:
 TOSH COST = 40 DB / 8 HRS
 EXCHANGE (DOUBLING) RATE = 5 DB
 THRESHOLD (CONTINUOUS) LEVEL = 80 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD = 1 MINUTES

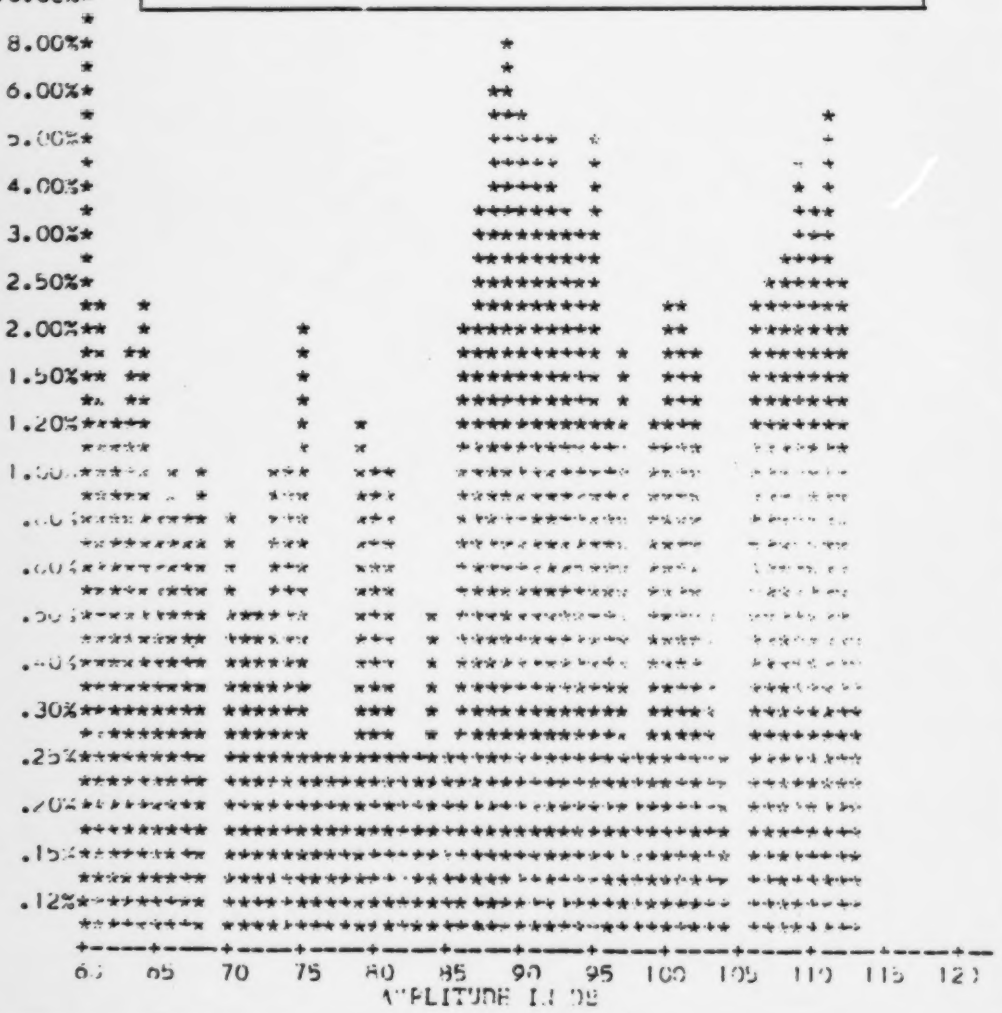
 TIME          LOG A                        ANTI-LOG
 HOUR     CURRENT   CUMULATIVE          CURRENT   CUMULATIVE
    1        88.0        88.0            9.506        9.51
    2        94.1        91.7           22.100       31.61
    3       102.2        97.0           67.598       99.20
    4       103.3        99.1           78.564      177.76
    5        99.4        99.2           45.894      223.65
    6        99.7        99.3           47.719      271.37
    7       105.4       100.5          105.087      376.46
    8        94.0       100.0           21.872      398.33
 MIN. COMP. = 60 DB                  MAX. COMP. = 113 DB
 ARITHMETIC MEAN = 87 DB
 STD. DEVIATION = 17 DB
 VARIANCE =289 DB
```

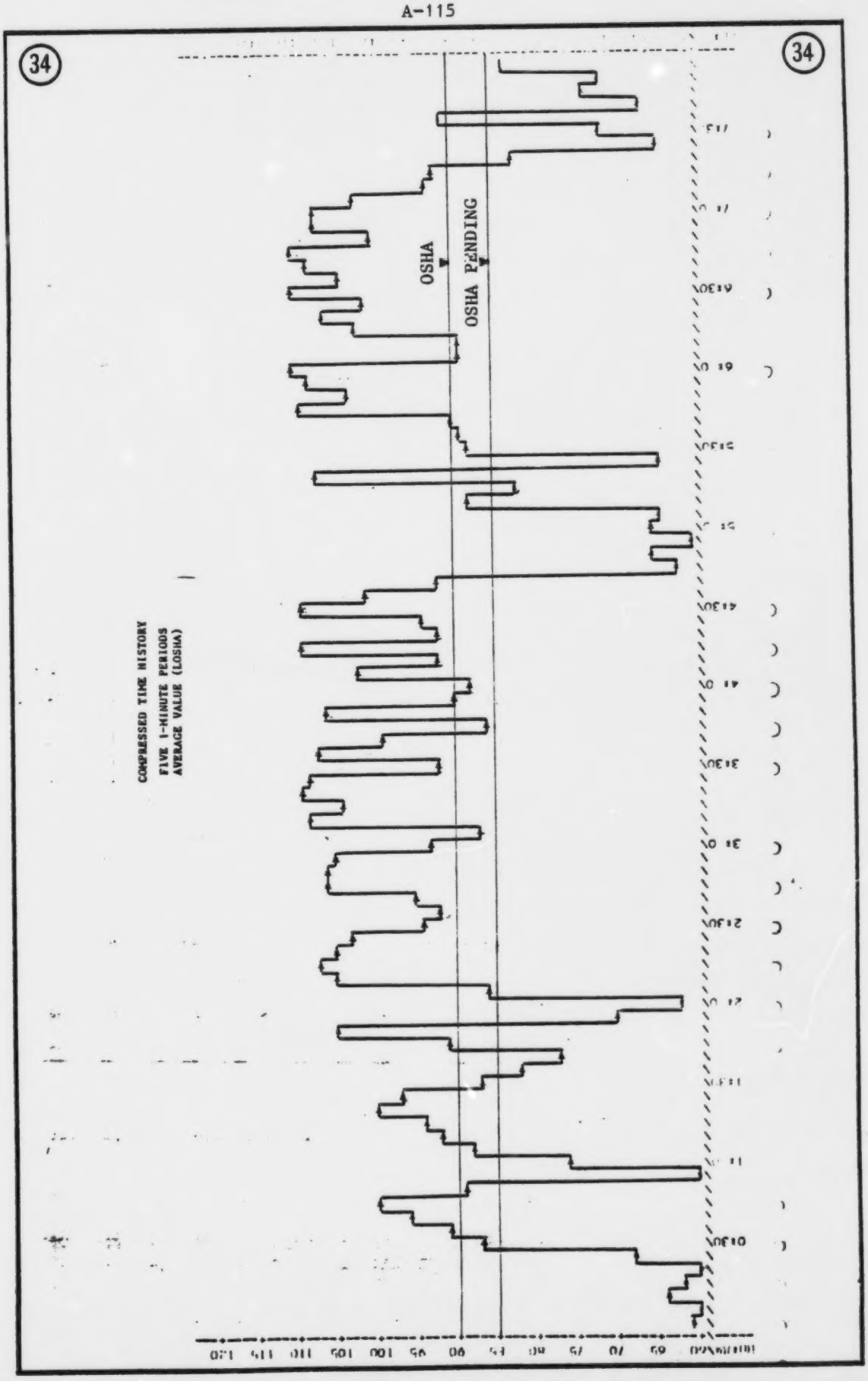
34 AMPLITUDE DISTRIBUTION 34

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
90	18.8	60 TO 64
14	2.9	65 TO 69
15	3.1	70 TO 74
16	3.3	75 TO 79
12	2.5	80 TO 84
79	16.5	85 TO 89
90	18.8	90 TO 94
37	7.7	95 TO 99
28	5.8	100 TO 104
50	10.4	105 TO 109
49	10.2	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




34
34
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(35)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1212    60    64     4     1
     104      115200   480
 73  64  60  60  60  66  62  65  60  60  60  62  63  70  80  71
 78  88  93  92  93  95  89  91  91  91  91  92  93  92  93  94
 95  95  92  92  92  92  92 100  96  97  98  97  97 100  99  95
100  98  80  62  60  60  60  40  88  94  85  85  72  61  60  60
 61  91  93  80  61  60  51  75  77  75  80  65  70  71  75  60
 62  76  69  66  63  60  74  72  61  60  74  66  61  69  75  65
 66  73  67  65  77  77  77  74  71  60  61  64  73  69  66  62
 67  60  65  62  66  70  67  60  66  62  61  62  64  61  64  69
 60  62  62  75  69  51  70  74  71  78  67  78  61  80  83  87
 90  84  70  66  77  62  87  97  77  85  76  80  73  80  72  61
 73  90  88  94  96  93  94  95  88  60  60  70  87  94  94  88
 85  85  89  82  87  82  85  90  84  84  84  84  82  80  80  80
 81  88  94  93  93  85  87  98  80  81  90 101 106 101 102 102
 94  84  80  88  90  97  95  90  91  80  90  88  95  93  96  95
 89  94  89  96  95  90  85  83  86  89  88  85  85  86  89  92
 93  90  86  84  84  84  84  80  91  90  87  91  92  95  93  96
 96  96  97  96  91  86  92  97  96  97  96  98  96  96  96  97
 96  98  96  97 100  95  95  94  92  96  96  95  95  95  95  98
 96  96  96  96  94  95  94  94  95  95  96  93  95  95  93  91
 99  99  97 101  97  97  93  96  99  98  98  95  97  93  94  93
 94  93  95  94 101  99  98  97  95 100 102 102 104 103  94 102
101  98 101 105 100 104 103 103 102 100 103 102 101 100  96  96
 91  79  60  60  61  60  60  60  73  60  75  62  60  60  64  65
 64  61  60  73  66  60  63  71  61  96  96  97  94  97 100 102
100  96 101 106 103 103 104 102 102 102 102 102 103 101 100 102
104 102 103 102 103 104 102 102 102 101 103 105 103 104 104 104
105 106 105 105 105 107 105 101 102 101 102 102 102 103 102 103
102 105 107  97  87  95  97  74  69  67  60  60  60  60  60  64
 60  72  72  77  60  63  64  79  72  62  68  62  60  60  64  65
 69  72  79  93  95 101 101  90  96 102  97  96  96  94  90  92
SEGM
```

(35)

```
ENTER LOG DATE (DD/MM/YR) : 17/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 7610
 ENTER JOB CODE (3 CHARS) : 281
```

```
    DATA LOGGED :17 JULY 1979
         LOGGER : DL-3C1/26
SERIAL NUMBER : 1212
     BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION =  8  H  0

DATA ANALYZED : 14 SEPT 1979
    SITE CODE : CC210
     JOB CODE : 281
    USER CODE : 7610
    THRESHOL  :  60 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =    1 0824
```

TIME HISTORY ANALYSIS

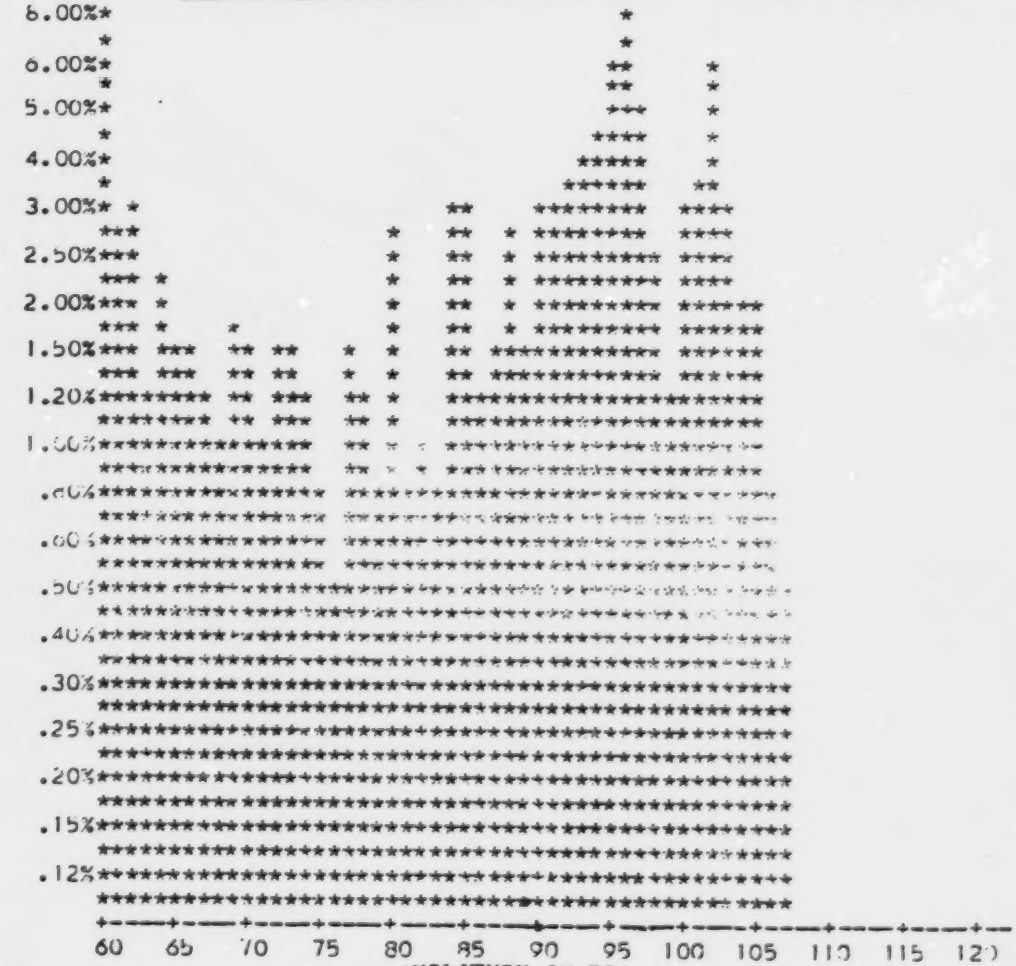
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

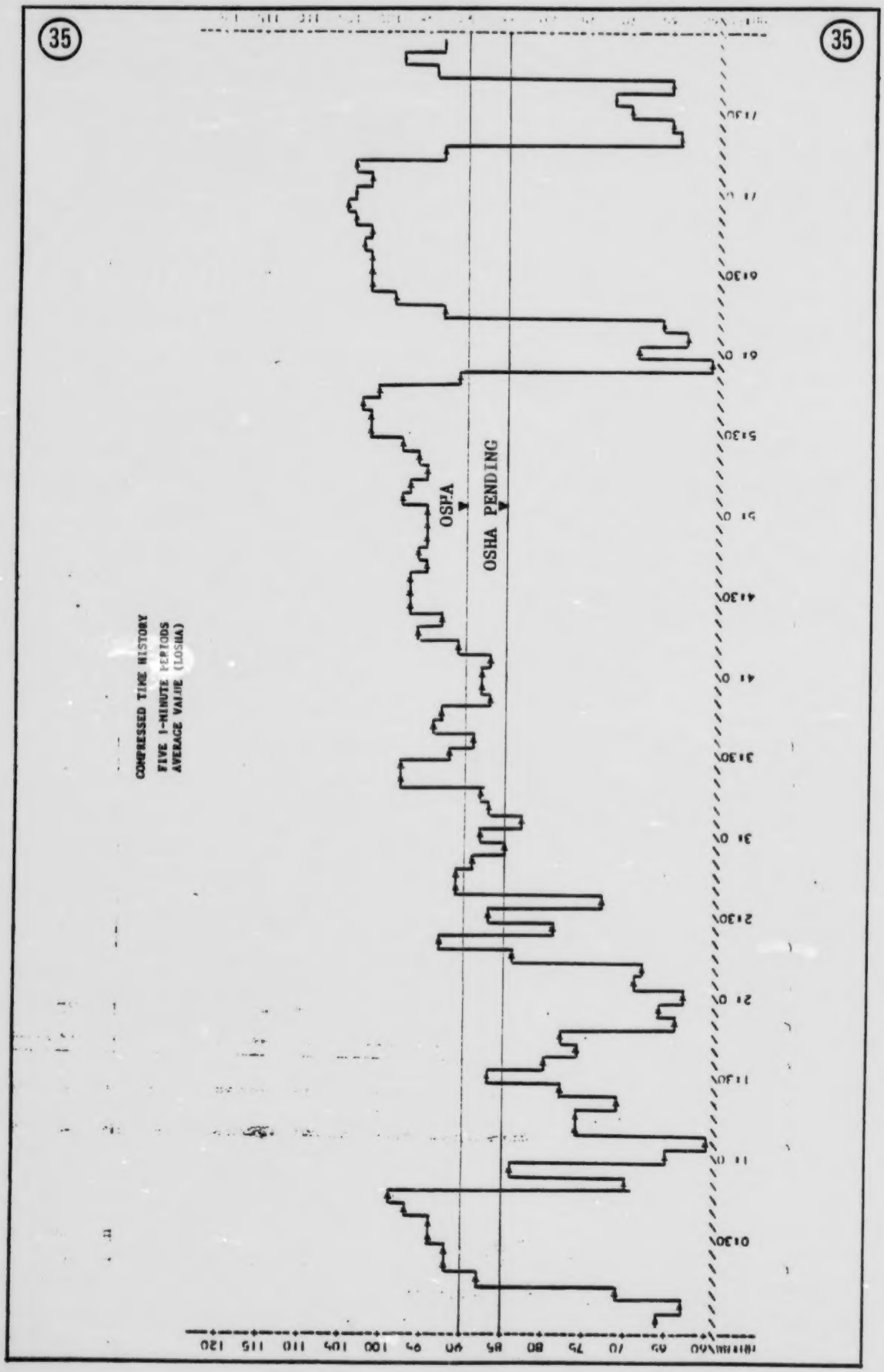
TIME	LOSHA		NOISE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	90.9	90.9	14.235	14.24
2	79.6	88.9	1.963	16.20
3	89.9	89.6	7.081	23.28
4	91.9	88.3	16.208	39.55
5	94.9	90.0	23.250	62.80
6	98.1	92.2	38.504	101.31
7	99.9	93.9	49.647	150.95
8	96.1	94.2	28.933	179.88

MIN. COMP. = 60 DB MAX. COMP. = 107 DB
ARITHMETIC MEAN = 85 DB
STD. DEVIATION = 15 DB
VARIANCE =225 DB

(35) AMPLITUDE DISTRIBUTION (35)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
81	16.9	60 TO 64
28	5.8	65 TO 69
27	5.6	70 TO 74
19	4.0	75 TO 79
34	7.1	80 TO 84
40	8.3	85 TO 89
74	15.4	90 TO 94
92	19.2	95 TO 99
72	15.0	100 TO 104
13	2.7	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




35
35
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSPA
OSHA PENDING
dBA/MAG
120
115
110
105
100
95
90
85
80
75
70
65
60
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(36)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1   26   80  1216    60    64     4     1
     212      115200   480
  64  60  60  61  63  69  66  67  68  68  73  75  69  60  62  66
  69  67  65  76  67  70  69  72  65  81  70  65  65  64  63  60
  61  72  60  62  60  67  69  74  72  74  73  75  86  90  90  92
  92  91  91  92  95  94  94  94  95  96  97  95  92  91  91  91
  90  94  92  91  87  90  90  92  87  89  88  86  89  83  82  80
  77  76  60  67  61  60  61  61  63  72  60  60  60  60  60  60
  60  61  60  60  60  70  61  64  71  67  60  61  60  60  60  60
  60  60  60  60  60  60  67  60  64  70  64  76  60  63  67  60
  60  60  60  60  60  60  60  60  60  67  62  60  60  60  60  69
  83  84  84  84  72  67  86  88  82  83  83  84  83  82  81  82
  85  86  84  83  88  88  89  81  78  80  87  87  85  93  95  99
 108 104 101 100  99  97  97  95  96  97  97  97  96  97  97  97
  97  98  98  97 100 107 105  96 101 106 107 109 112 108 107 106
 105 107 108 108 107 108 108 109 108 105 102 106 106 103  99  92
  92  99  99  97  97  99  97  93 103 103 103 102 102 102  99  92
  85  72  61  60  60  60  60  60  71  71  60  61  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  70  60  60  60  63  60  60  60
  60  60  60  60  62  60  60  60  60  60  60  60  60  60  60  61
  60  65  67  61  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  62  60  60  74  72  69  60  60  60  65  62  66
  60  69  61  65  83  85  85  86  88  87  86  84  82  84  92  88
  88  89  86  89  73  60  81  89  85  86  64  61  60  60  60  60
  61  65  71  68  64  60  60  61  70  82  75  78  77  78  76  83
  84  82  80  73  79  80  81  81  81  80  77  82  80  80  82  89
  84  78  64  67  60  62  67  71  79  77  78  62  60  60  60  60
  60  62  61  60  60  60  60  62  60  69  60  60  60  60  60  61
  63  60  60  65  61  60  60  60  60  60  60  60  60  60  67  81  70
  70  65  94  97  82  83  92  90  88  87  61  60  60  60  60  64
  60  72  64  66  62  77  89  90  92  90  92  87  86  90  95  93
%EOF
```

(36)

```
ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : 20960
ENTER USER CODE (4 CHARS) : 4195
 ENTER JOB CODE (3 CHARS) : 271
```

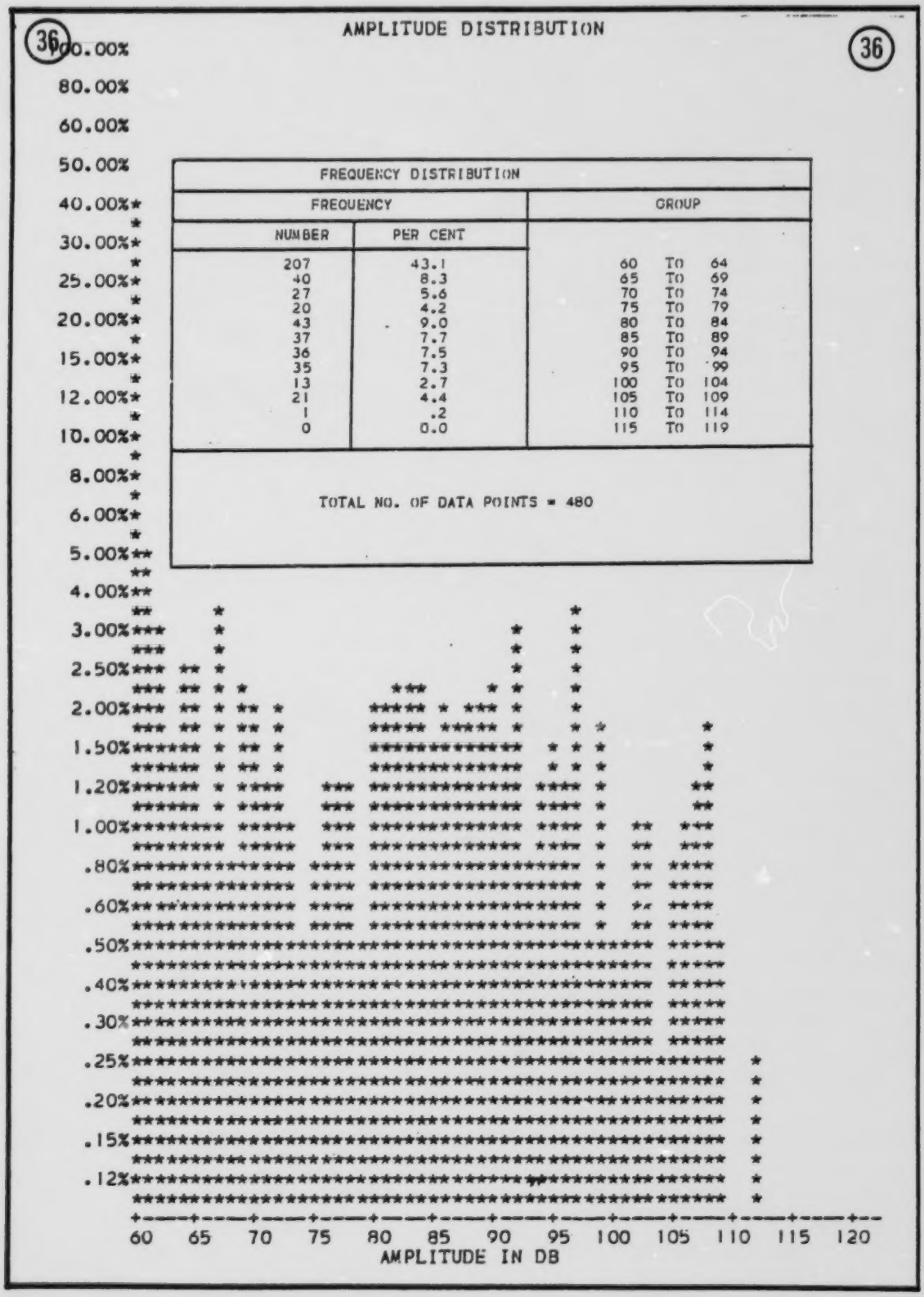
```
   DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : 20960
SERIAL NUMBER : 1216                      JOB CODE : 271
    BASELINE : 60 DB                    USER CODE : 4195
DYNAMIC RANGE : 64 DB                    THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC             TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0           STANDBY TIME =   0: 0:53
```

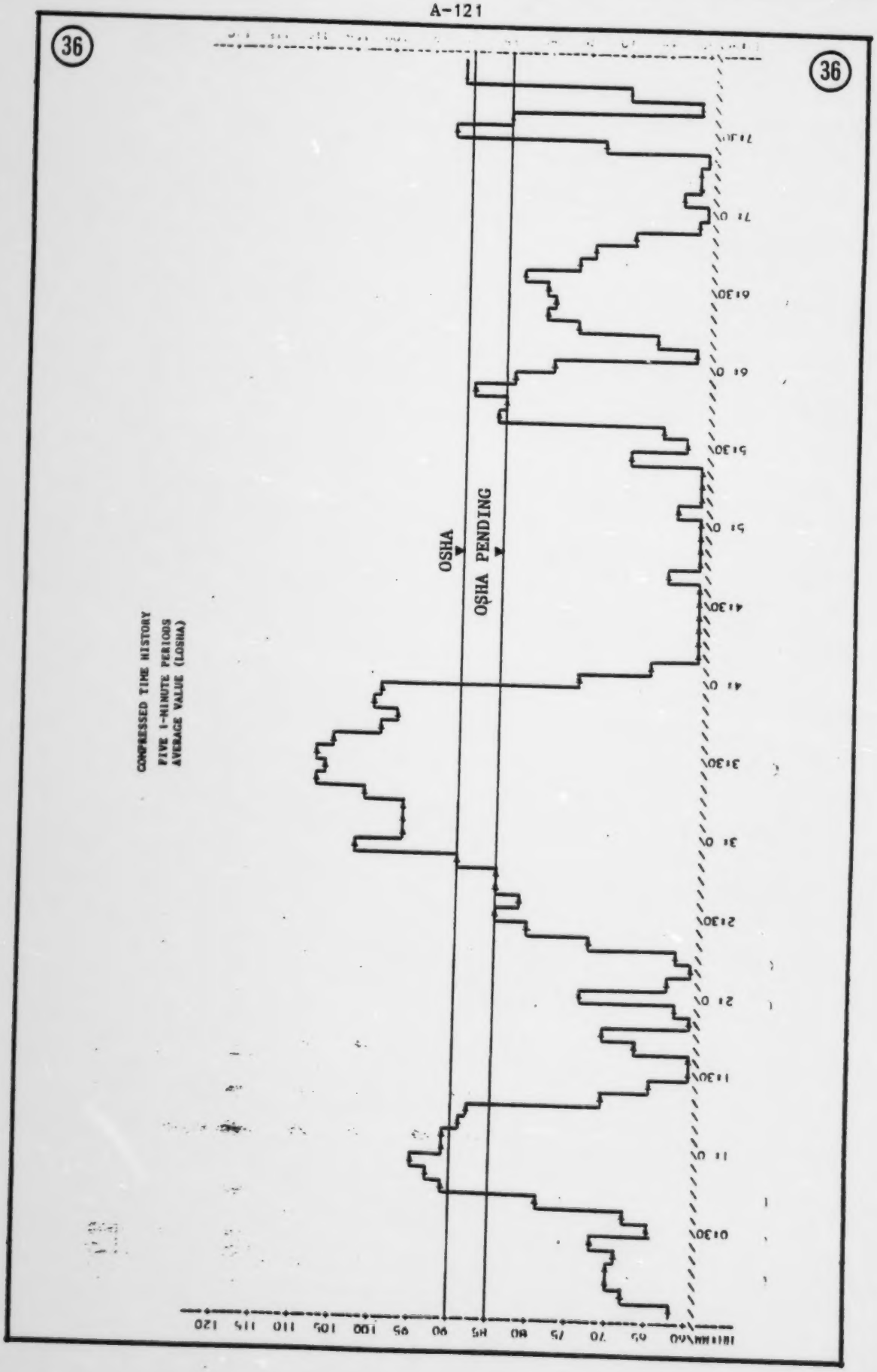
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 9 Db / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGdA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	84.4	84.4	5.726	5.73
2	82.5	83.5	4.425	10.15
3	88.5	85.6	10.084	20.24
4	103.0	94.7	76.011	96.25
5	64.1	93.1	.347	96.59
6	78.7	92.0	2.612	99.21
7	76.7	91.0	1.971	101.18
8	82.6	90.4	4.477	105.65

MIN. COMP. = 60 DB MAX. COMP. = 112 DB
ARITHMETIC MEAN = 74 DB
STD. DEVIATION = 15 DB
VARIANCE =225 DB


36
AMPLITUDE DISTRIBUTION
36
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
207 43.1 60 TO 64
40 8.3 65 TO 69
27 5.6 70 TO 74
20 4.2 75 TO 79
43 9.0 80 TO 84
37 7.7 85 TO 89
36 7.5 90 TO 94
35 7.3 95 TO 99
13 2.7 100 TO 104
21 4.4 105 TO 109
1 .2 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


36
36
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
01:30
11 01
11:30
21 01
21:30
31 01
31:30
41 01
41:30
51 01
51:30
61 01
61:30
71 01
71:30

(37)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1224   60   64    4    1
    372    111091  462
  62  60  60  65  60  60  60  60  69  60  60  60  61  60  60  66
  71  82  81  60  60  60  65  60  70  60  62  60  60  60  66  60
  60  68  61  76  74  63  61  60  60  60  60  60  60  60  60  60
  68  60  60  60  60  60  60  61  62  60  60  60  60  60  60  79
  83  83  84  85  85  83  83  83  83  83  83  85  90  90  90  90
  90  89  87  84  87  91  99 107 106  97  95  96  96  89  88  97
  97  96  98  97  95  96  96  95  94  94  94  95 100 107 105 103
 105 101 106 109 110 108 108 107 103 110 108 108 104 107 109 110
 109 106 105 107 107 107 105  96  96  97  98  97  97  99  98  93
 101 105 102 103 101 101 102  96  87  74  71  75  60  60  60  60
  60  78  63  66  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  72  60  60  60  66  60  60  60  60  60  60  64  60  60  60
  60  60  60  60  60  60  60  60  65  64  71  72  61  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  63  60  60  70
  77  78  66  60  60  60  68  65  74  69  61  68  67  80  76  72
  86  83  85  85  87  89  87  94  84  88  87  81  87  60  66  86
  90  85  84  63  64  60  63  60  60  65  73  67  66  66  64  60
  60  80  83  78  80  78  78  78  83  84  82  78  74  82  83  82
  81  81  78  80  81  78  80  82  81  83  67  73  60  60  62  60
  75  77  86  60  61  60  60  60  60  64  60  60  60  60  60  60
  63  60  70  60  60  60  60  60  62  62  60  61  60  60  60  60
  60  60  60  61  60  60  76  79  80  78  88  94  93  81  90  93
  90  89  83  69  63  70  62  60  77  77  69  76  75  77  86  94
  93  94  95  94  91  89  96  99  97  98  96  91  96  75  61  60
  61  66  67  61  60  60  60  60  61  78  71  84  84  73  60  61
  64  63  60  60  60  60  60  60  63  60  60  60  64  60  60  60
  60  60  60  60  60  61  70  60  67  64  63  61  73  60  60  60
  63  60  60  60  60  60  60  60  60  60  72  61  69  67  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
%EOF


ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : 20960

ENTER USER CODE (4 CHARS) : 4350
 ENTER JOB CODE (3 CHARS) : 272


   DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 20960
SERIAL NUMBER : 1224                       JOB CODE : 272
     BASELINE : 60 DB                     USER CODE : 4350
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  111091
TEST DURATION =   7:42:52             STANDBY TIME =   0: 1:33

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 462
PERIOD =  1 MINUTES

TIME          LOGIA                    DOSE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1       65.7       65.7         .428         .43
   2       98.6       93.7      41.236       41.66
   3       99.7       96.3      47.993       89.66
   4       62.0       94.2         .259      89.92
   5       80.4       92.9        3.312      93.23
   6       73.3       91.7        1.238      94.47
   7       87.2       91.2        8.484     102.95
   8       63.0       90.5         .207     103.16
MIN. COMP. =  60 DB              MAX. COMP. = 110 DB
ARITHMETIC MEAN =  73 DB
STD. DEVIATION =  16 DB
VARIANCE =256 DB
```

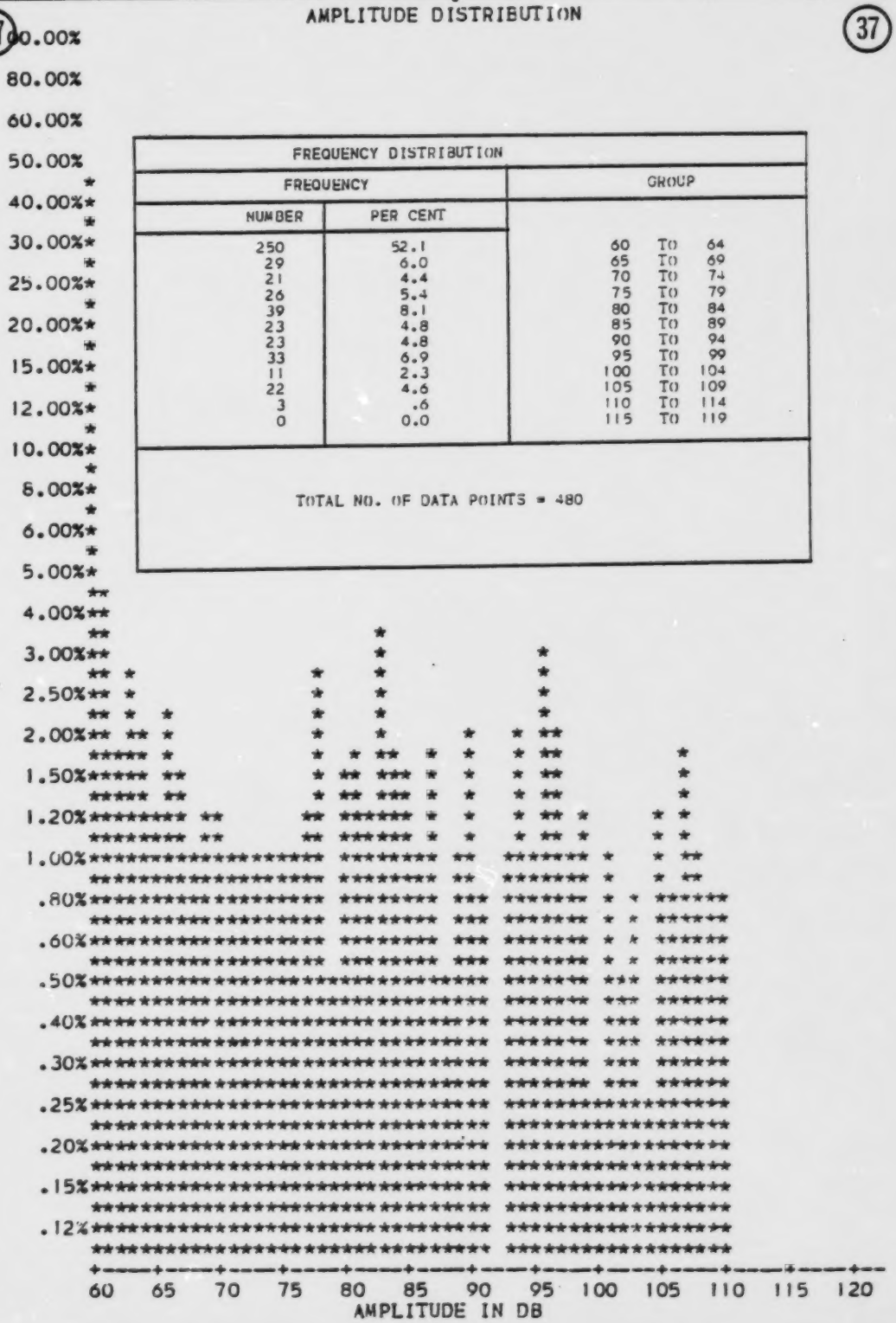
(37)

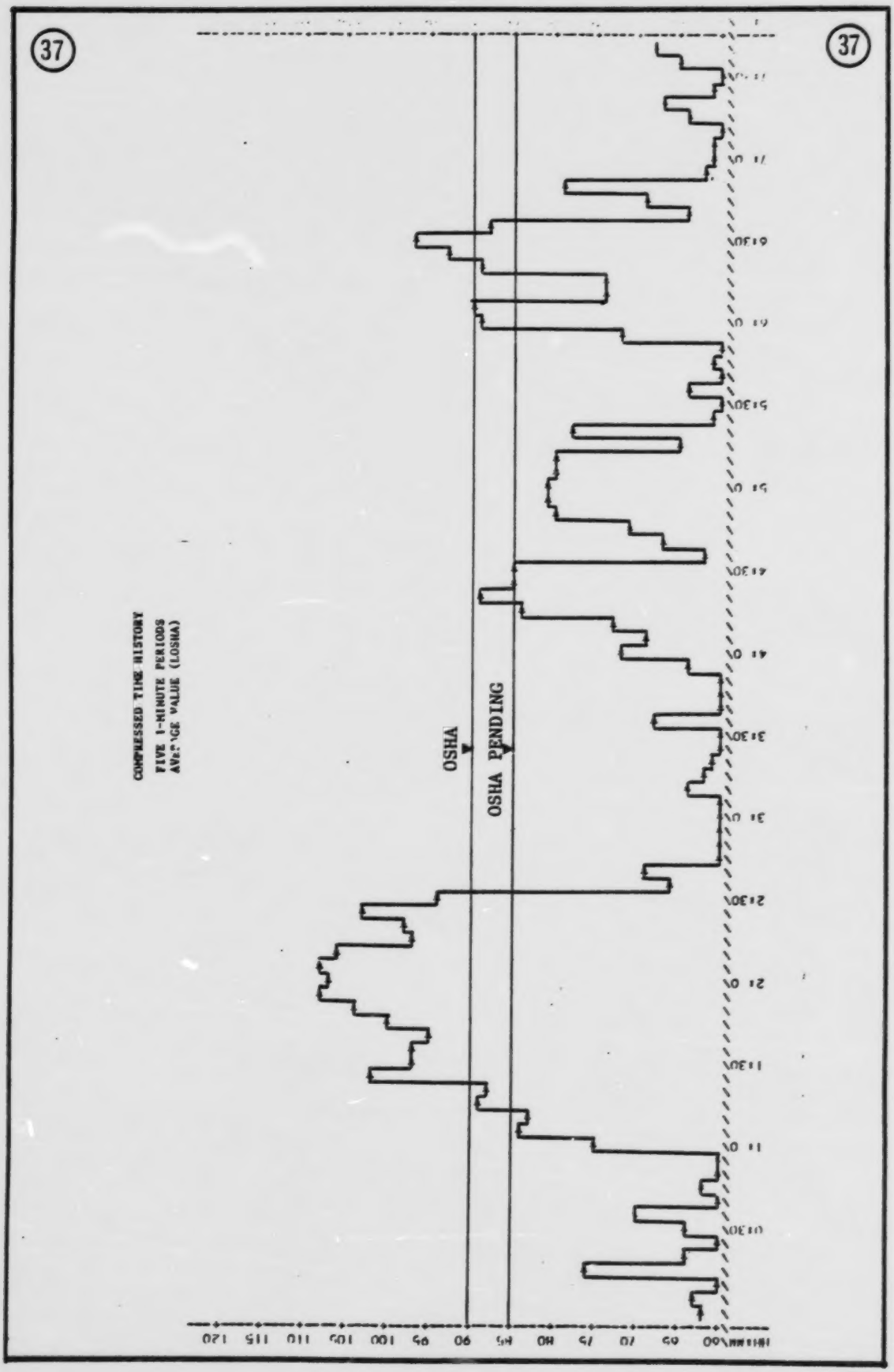
AMPLITUDE DISTRIBUTION

(37) (37)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
250	52.1	60 TO 64
29	6.0	65 TO 69
21	4.4	70 TO 74
26	5.4	75 TO 79
39	8.1	80 TO 84
23	4.8	85 TO 89
23	4.8	90 TO 94
33	6.9	95 TO 99
11	2.3	100 TO 104
22	4.6	105 TO 109
3	.6	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




37
37
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
01:30
11 01
11:30
21 01
21:30
31 01
31:30
41 01
41:30
51 01
51:30
61 01
61:30

(38)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225    60    64     4     1
      89     115200   480
  66  64  66  65  61  65  69  74  74  69  60  64  66  65  67  67
  76  64  67  63  70  72  68  60  60  60  60  61  60  60  62  60
  60  60  66  72  69  69  73  64  77  89  89  89  89  92  91  89
  91  98  98  98  99  99 100 101  97  97  95  96  94  92  96  94
  93  90  93  93  95  91  92  93  90  91  74  73  71  61  66  60
  67  70  65  66  60  66  65  65  60  60  62  72  62  60  62  60
  60  60  60  62  60  66  77  60  60  60  60  60  60  60  65  61
  65  68  65  60  60  60  75  60  77  91  83  80  94  87  82  82
  82  82  82  82  82  82  82  82  82  82  82  92  96  88  92  81
  79  80  79  82 106 114 114 114 114 115 115 115 115 115 115 115
 115 115 115 115 115 115 115 114 114 114 115 117 118 119 117 115
 115 115 115 118 115 115 115 115 116 117 120 115 116 116 116 115
 116 115 115 115 115 119 117 118 116 116 116 115 116 119 118 117
 115 115 116 119 116 116 116 118 118 119 117 117 117 115 118 120
 116 116 116 117 116 116 119 115 117 115 117 117 119 119 115 115
 115 118 119 118 118 115 116 115 118 118 116 115 115 115 115 115
 115 118 117 117 118 116 116 116 118 116 116 116 115 116 117 116
 116 115 116 119 118 118 119 116 116 117 115 116 119 115 115 115
 114 114 118 114 115 115 115 115 116 117 115 119 120 118 115 116
 115 116 116 119 120 119 117 115 116 115 116 119 116 116 114 114
 114 114 116 118 117 115 115 115 116 115 116 119 114 114 114 114
 115 115 115 115 115 114 114 114 114 114 114 114 114 114 115 115 115
 116 116 116 115 115 116 116 116 116 116 116 116 116 116 116 116 116
 115 115 115 115 114 114 115 119 117 115 115 115 116 116 116 114
 114 117 118 118 115 114 115 114 118 117 115 115 115 117 115 115
 115 118 117 115 115 114 117 115 116 116 116 116 118 116 116 115
 116 117 115 116 115 118 115 118 118 116 116 116 117 116 116 117
 116 116 114 115 115 115 115 116 115 115 114 115 116 117 116 115
 115 116 115 101  94  93  92  89  80  66  60  67  61  66  68  76
  64  63  73  65  88  93  93  92  94  91  88  90  97  96  95  97
%EOF


ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : 20960
ENTER USER CODE (4 CHARS) : 0335
 ENTER JOB CODE (3 CHARS) : 271


   DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 20960
SERIAL NUMBER : 1225                       JOB CODE : 271
     BASELINE : 60 DB                     USER CODE : 0335
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:22

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 Db / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                      EDOSE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1       87.8       87.8        9.170       9.17
   2       82.9       85.7        4.657      13.83
   3      110.7      103.3      221.877     235.70
   4      116.7      109.4      504.253     739.95
   5      116.4      111.5      486.445    1226.40
   6      115.8      112.4      446.286    1672.68
   7      115.8      113.0      449.836    2122.52
   8      111.3      112.8      238.828    2361.35
MIN. COMP. =  60 DB              MAX. COMP. = 120 DB
ARITHMETIC MEAN = 101 DB
STD. DEVIATION =  21 DB
VARIANCE =441 DB
```

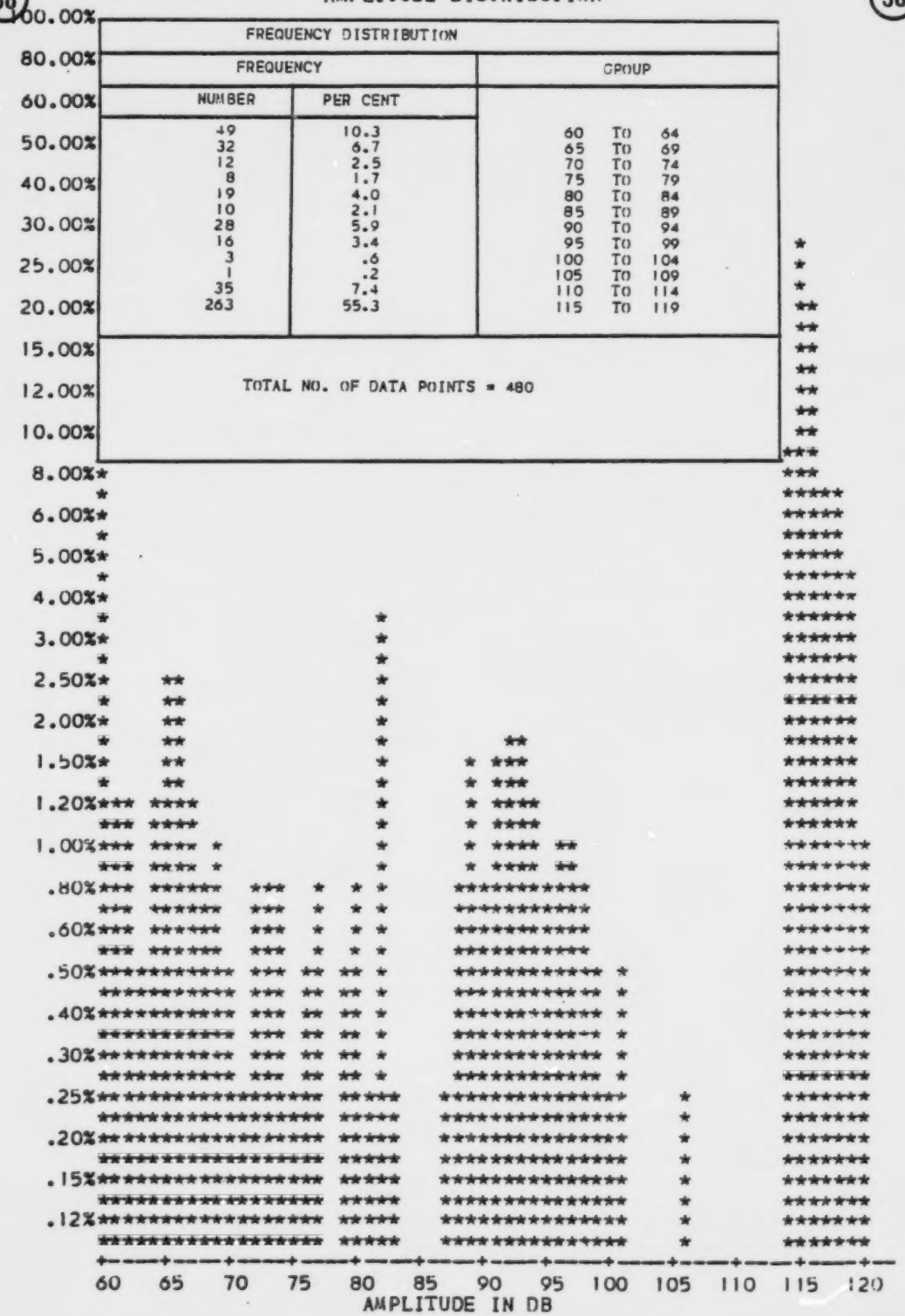
(38)

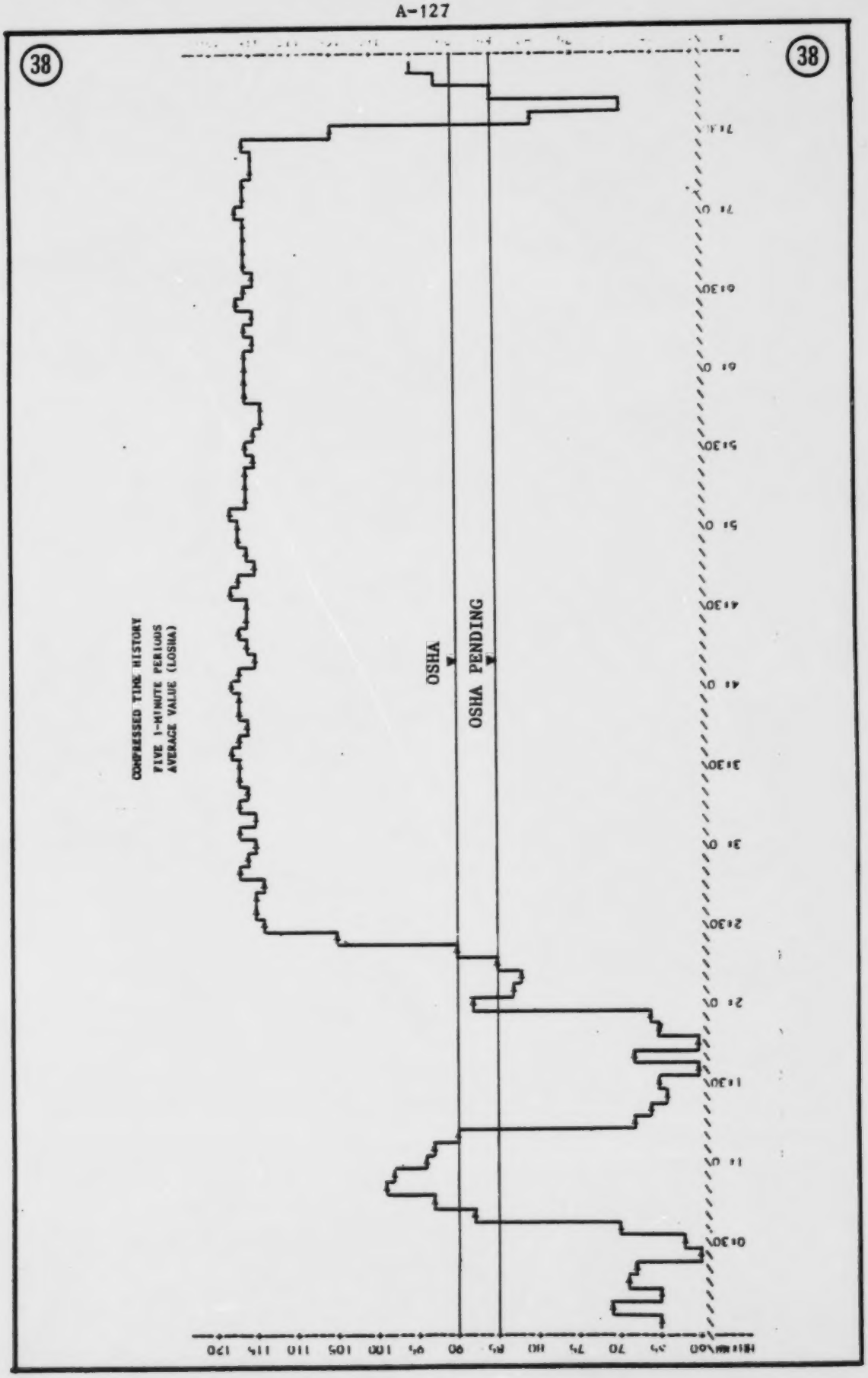
(38) AMPLITUDE DISTRIBUTION (38)

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
49	10.3	60 TO 64
32	6.7	65 TO 69
12	2.5	70 TO 74
8	1.7	75 TO 79
19	4.0	80 TO 84
10	2.1	85 TO 89
28	5.9	90 TO 94
16	3.4	95 TO 99
3	.6	100 TO 104
1	.2	105 TO 109
35	7.4	110 TO 114
263	55.3	115 TO 119

TOTAL NO. OF DATA POINTS = 480




38
38
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
7:30
7:00
6:30
6:00
5:30
5:00
4:30
4:00
3:30
3:00
2:30
2:00
1:30
1:00
0:30
120
115
110
105
100
95
90
85
80
75
70
65
60

(39)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1219   60   64    4    1
    104     115200  480
  60  60  62  70  60  62  60  64  62  63  61  71  66  60  61  66
  60  60  60  60  61  60  60  62  60  60  60  66  60  60  60  60
  60  63  60  79  64  60  67  67  64  64  62  68  70  61  72  83
  87  87  93  93  94  95  97  97  94  95  96  98 100 100 100  94
  99  96  90  94  98  94  94  92  98  97  95  80  64  61  60  68
  60  60  60  60  60  60  60  63  60  60  60  60  61  66  60  61
  66  62  77  70  60  60  65  73  60  60  62  66  86  89  92  85
  72  67  63  60  61  68  69  78  80  87  82  87  70  78  69  76
  88  96  94  90  89  74  71  74  65  60  65  85  79  84  86  88
  88  92  92  96  97  94  95  93  84  72  61  71  95  89  84  67
  61  60  68  81  84  80  71  65  68  69  65  60  94  92  66  60
  60  60  60  60  65  60  60  60  62  60  60  60  60  60  60  60
  60  60  90  97  80  60  60  60  60  91  99  93  76  75  72 109
 106  91  90  96  83  98 110 110 111 108 105 111 111 110 107  99
  86  86  97 104 111 112 110 108 108 111 113 114 110  91  96  82
  78  78  79  79  72  92  94 106 109 108 107 102 109 113 113 112
  96 104  94  92  85  93  90  96  79  75  75  61  60  90  94  95
  95 100 103  94  89 105 104 104 102 103 107 108 108 102  95 104
 107 106 109 106  92  92  86  91  93  71  64  93  75  60  60  60
  60  60  60  70  66  60  60  60  60  60  60  71  77  88  64  74
  60  60  73  77  60  60  60  60  76  70  72  70  79  74  77  73
  72  83  77  77  64  65  68  73  69  77  75  67  72  77  79  63
  78  82  85  88  83  63  78  60  85  89  92  91  75  77  85 100
  87  85  61  97  90  86  94  96  94  89  93  93  90  94  70 105
  95  60  60  63  61  60  60  69  60  61  65  64  75  82  83  82
  80  74  60  60  61  63  70  62  79  86  96 102  86  85  81  84
  91  88  92  85  60  60  60  60  60  60  60  66  60  62  60
  61  61  60  60  61  60  60  60  60  67  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  62  60  70  60  62  65  60  62  60  60  60  60
%EOF


ENTER LOG DATE (DD/MM/YR) : 27/07/79

ENTER SITE CODE (5 CHARS) : 22304

ENTER USER CODE (4 CHARS) : 2814
 ENTER JOB CODE (3 CHARS) : 281


    DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
         LOGGER : DB-301/26                SITE CODE : 22304
SERIAL NUMBER : 1219                       JOB CODE : 281
     BASELINE : 60 DB                     USER CODE : 2814
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:26

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                    %DOSE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1        83.5       83.5        5.044        5.04
   2        87.5       85.8        8.890       13.93
   3        85.9       85.8        7.061       21.00
   4       102.9       94.7       74.943       95.94
   5       101.8       96.8       64.335      160.27
   6        74.6       95.5        1.476      161.75
   7        89.0       94.9       10.901      172.65
   8        61.0       93.9         .224      172.87
MIN. COMP. =  60 DB              MAX. COMP. = 114 DB
ARITHMETIC MEAN =  76 DB
STD. DEVIATION =  17 DB
VARIANCE =289 DB
```

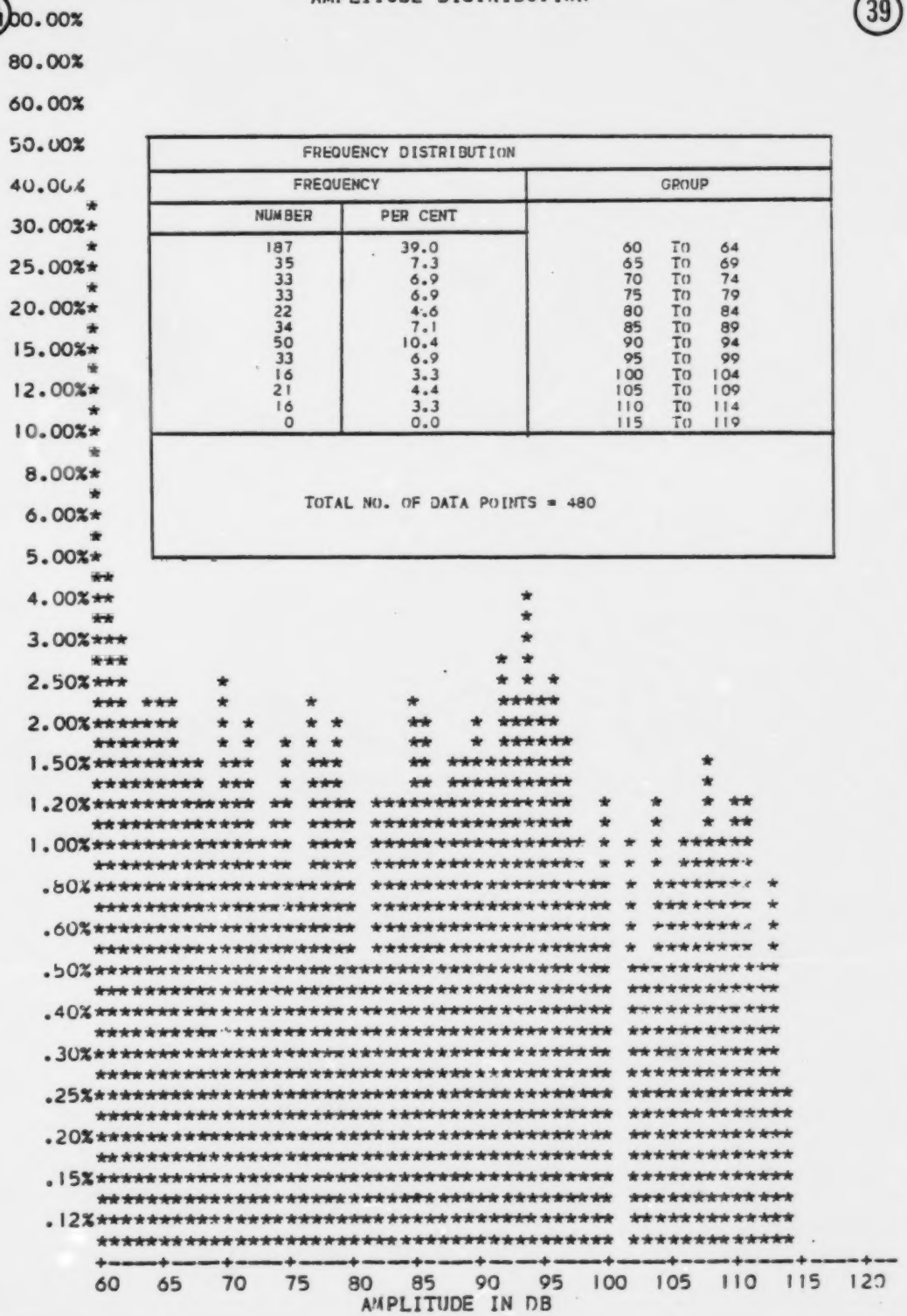
(39)

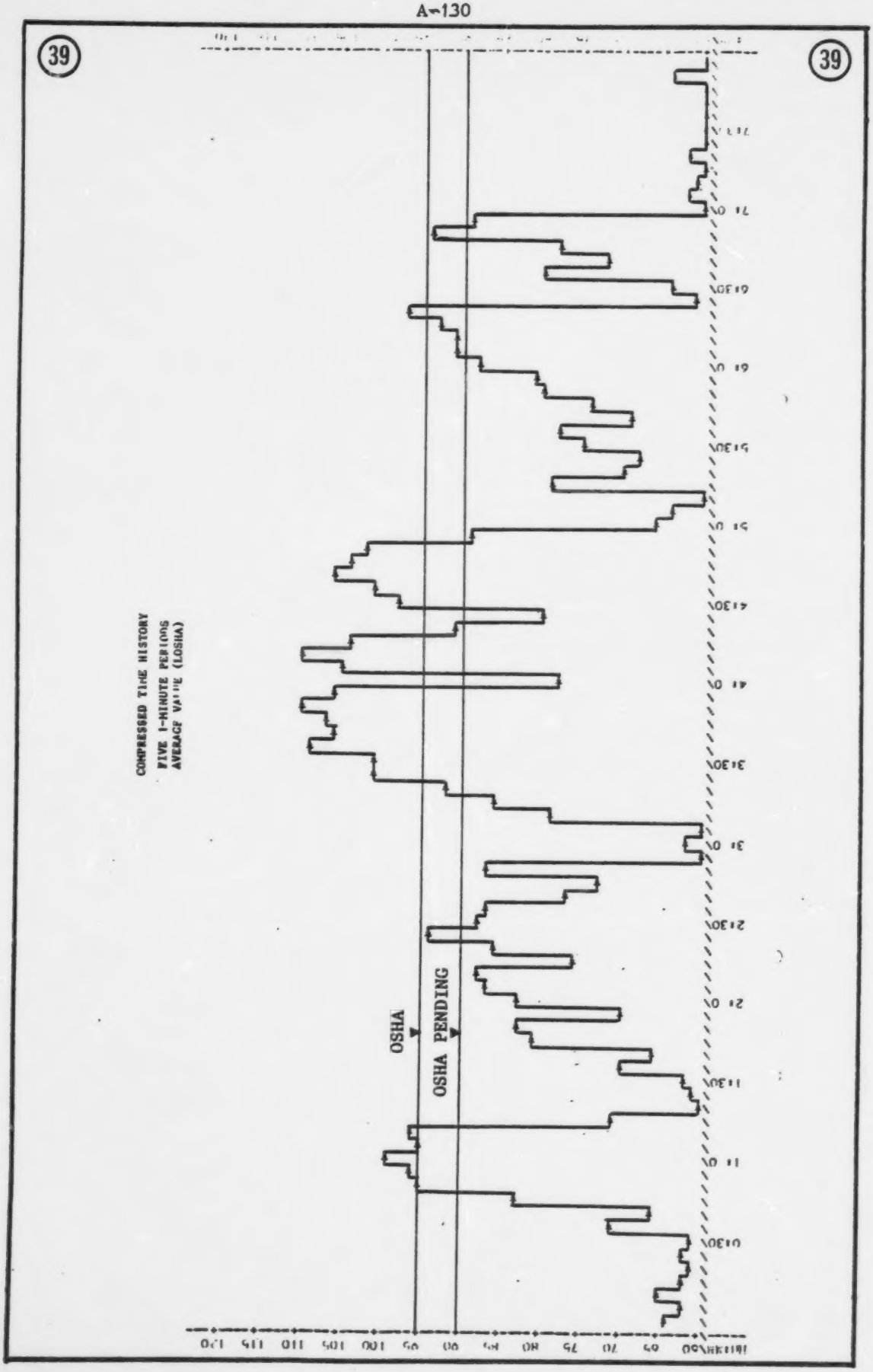
AMPLITUDE DISTRIBUTION

(39) (39)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
187	39.0	60 To 64
35	7.3	65 To 69
33	6.9	70 To 74
33	6.9	75 To 79
22	4.6	80 To 84
34	7.1	85 To 89
50	10.4	90 To 94
33	6.9	95 To 99
16	3.3	100 To 104
21	4.4	105 To 109
16	3.3	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




39
39
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
60
65
70
75
80
85
90
95
100
105
110
115
120

(40)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  121    60    64     4     1
     58     115200   480
  70  61  64  66  68  76  69  61  60  60  62  66  60  60  60  60
  60  71  63  63  62  62  60  60  61  60  60  60  60  64  70  76
  66  67  66  90  90  94 101 100  99 100 100  96  99  99  87  87
  77  67  67  61  60  60  60  60  60  62  62  61  68  64  64  64
  63  60  61  60  63  60  58  60  62  64  60  61  62  61  61  60
  60  74  72  75  60  62  86  91  98  97  97  95  95  95 100 101
 102 103  98  96  98  95  95  87  86  96  91  91  97  97  99 100
 101  98  91  94 102 102 102 103 104  99  90  90  91  91 100 100
 101  96  98 100  90  88  94  97  94  99  93  88  88  96  79  77
  79  76  80 102 101  98 104 114  98  93  94  94  97  94  99  98
  95  87  94  92  74  69  85  60  83  60  60  86  69  82  60  60
  63  72  60  60  69  99  99 100  98 101  93  94  98  92  71  76
  71  70  69  66  75  72  70  73  77  75  66  69  61  96  94  98
 100 102 109 107 107 105 106 106 104  99  99  99  98  94  92  85
  85  86  93  97  97  89  77  84  73  67  60  62  62  69  85  91
  93  98 101  97  97 109 112 112 111 109 108  91  91  90  90  90
  90  94  96  98  92  60  60  61  60  60  60  60  61  60  60  60
  60  62  64  61  66  61  64  61  65  60  60  61  58  60  60  60
  60  60  60  61  60  65  63  60  62  65  61  61  62  65  62  65
  66  74  75  75  62  60  60  60  60  63  62  60  65  66  63  92
  97  95 100  86  92 103 100 103 108 110 109 110 106  90  88  91
 103 111 109  89  96  91  89  90  91  94  90  88  95  99  97  98
  92  87  92  97 101 102  92  90  90 100 102  99  99  97  84  96
  96 100 101  88  93  97 105 106  99  90  91  84  97 101 103  96
  91  93 105 112 112 111 108 111 109 109 104  89  90 106  99  88
  92  75  70  82  91 104 112 111 112 107 104  84  74  83  90  89
  91  92  90  90  90  90  90  89  89  89  89  89  91  90  90  90
  90  72  60  60  60  65  60  60  84  60  90  75  76  92  88  69
  67  68  63  60  60  67  74  67  60  66  78  78  75  82  78  73
  60  66  64  67  60  61  60  60  60  60  60  60  60  60  60  60
EOF



ENTER LOG DATE (DD/MM/YR) : 20/07/79
ENTER SITE CODE (5 CHARS) : 26210
ENTER USER CODE (4 CHARS) : 4719
 ENTER JOB CODE (3 CHARS) : 296


   DATA LOGGED :20 JULY 1979          DATA ANALYZED : 17 SEPT 1979
        LOGGER : 08-301/26                 SITE CODE : 26210
SERIAL NUMBER : 1214                        JOB CODE : 296
      BASELINE : 50 DB                     USER CODE : 4719
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8H 0M 0            STANDBY TIME =   0H 0M14

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOTAL DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUT-OFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

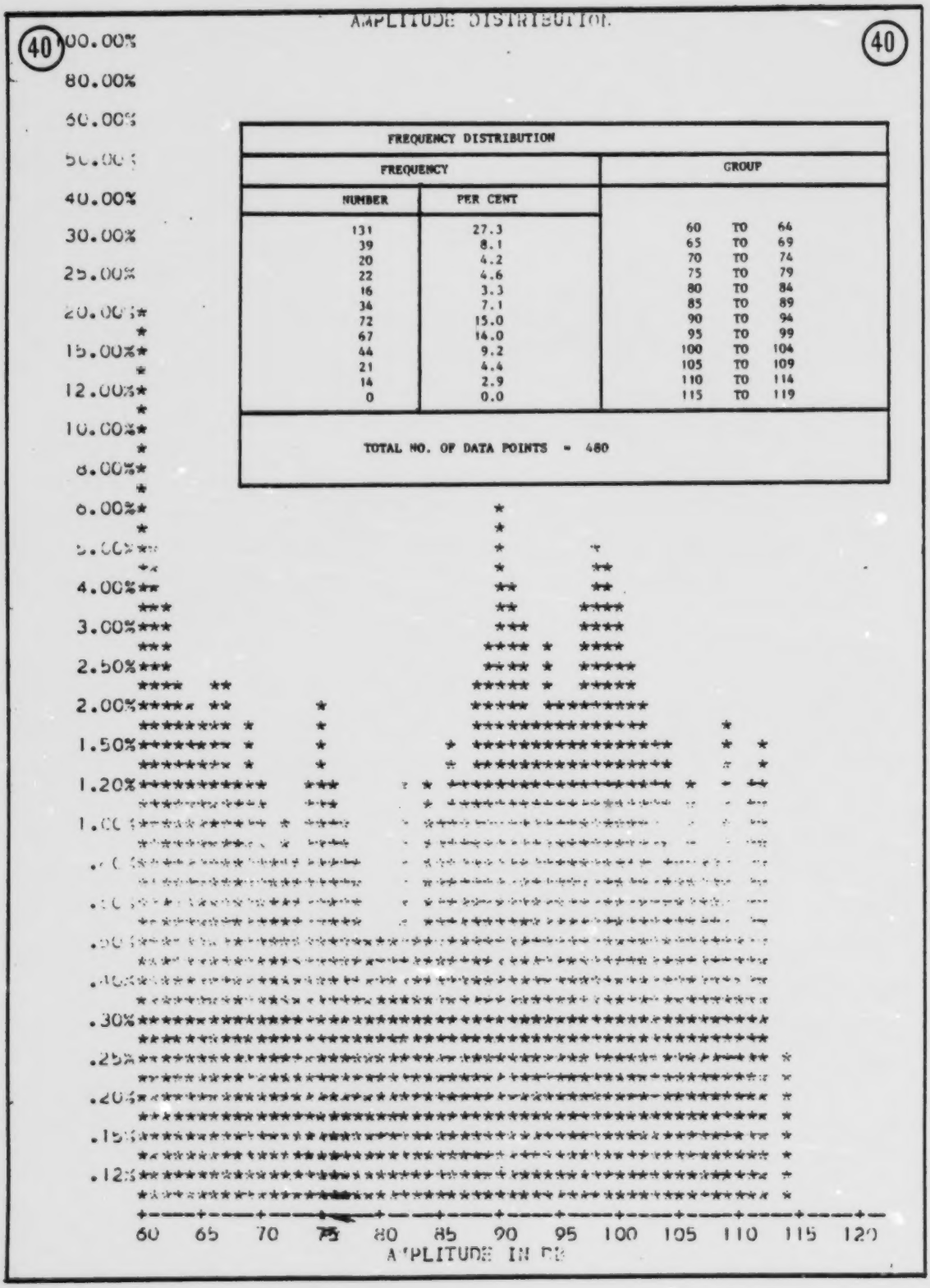
TIME          OSHA                    NOISE
HOUR     CURRENT  CUMULATIVE     CURRENT  CUMULATIVE
   1        86.5       86.5       7.475        7.47
   2        93.4       90.8      20.150       27.83
   3        95.7       92.8      27.553       56.36
   4        96.2       93.8      29.174       84.75
   5        95.6       94.2      27.180      111.93
   6        97.8       94.9      36.792      148.72
   7       102.2       96.5      67.604      216.33
   8        81.5       95.7       3.425      220.15
MIN. COMP. =  60 DB              MAX. COMP. = 114 DB
ARITHMETIC MEAN =  82 DB
STD. DEVIATION =  17 DB
VARIANCE =289 DB
```

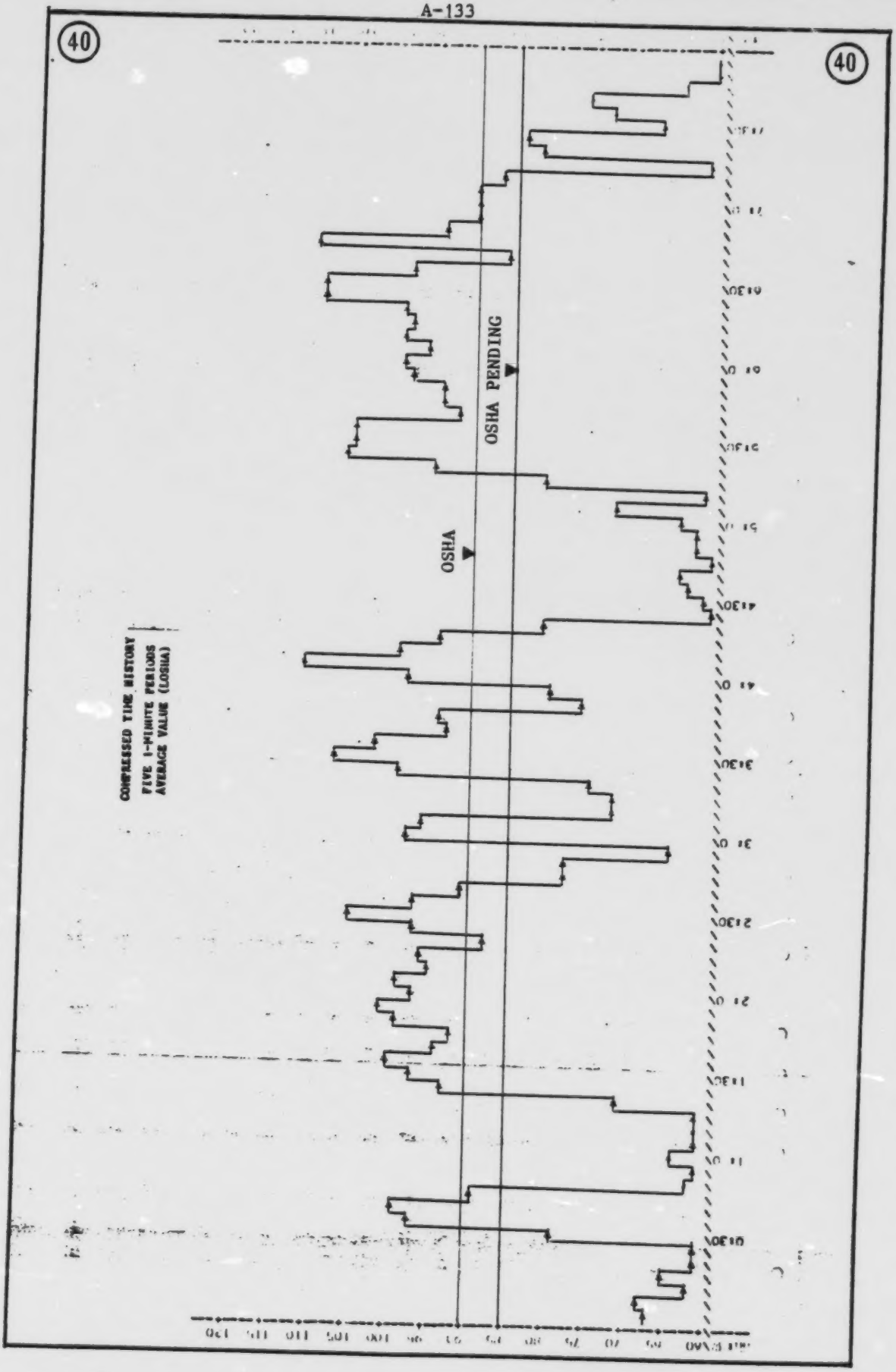
(40)

AMPLITUDE DISTRIBUTION

(40) (40)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
131	27.3	60 TO 64
39	8.1	65 TO 69
20	4.2	70 TO 74
22	4.6	75 TO 79
16	3.3	80 TO 84
34	7.1	85 TO 89
72	15.0	90 TO 94
67	14.0	95 TO 99
44	9.2	100 TO 104
21	4.4	105 TO 109
14	2.9	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




40
40
OSHA PENDING
OSHA
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(41)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1217   60   64    4    1
  22428    112373  468
 60  60  60  60  60  63  60  67  60  63  60  62  61  60  60  60
 60  60  64  60  60  74  60  62  60  77  72  73  60  67  60  63
 67  76  79  81  77  71  60  60  60  61  60  60  64  60  60  60
 60  66  71  69  72  73  76  73  73  69  75  74  66  74  74  74
 78  72  74  73  69  62  69  68  67  67  70  93  89  91  92  96
 96  94  97  97  92  95  94  95  94  95  96  86  93  89  92  84
 66  60  63  63  71  64  67  67  76  83  91  71  86  95  93  88
 89  94  86  88  80  77  71  80  75 102 100 112  99  94  94  95
 95  92  92  92  91  93  97  94  93  92  98  99  98  96  91  91
 90  94  93  95  90  91  93  95  89  96  94  95  97  92  94  98
 99 104 105 108 111 111 110 109 110 112 111 111 110 111 112 104
110 110 109 106 110 111 112 110 107 107 101 102 104  97  98  97
101  93  90  91  91 103 102 100  91  97  99  96  93 100 103 107
103  97 102 107  97 110 112 110 109 110 111 112 113 112 109 104
114 114 113 112 110 111 107 108 105  98  92  94 104 104  95  94
 94 110 112 110 110 108 109 109 109 107 108 110 110 110 110 107
107 106 107 107 107 106 105  95  97  93  92  93  94  95  96  96
 95  96  97  94  92  96  97  94  99  96  92  98  94  95  95  94
 96  95 100  94 100 104 111 111 111 110 108 110 111 111 108 111
112 113 114 108  91  91  96 109 110 111 111 111 111 111 109 109
108 105  86  80  74  66  64  62  60  60  60  63  64  60  60  60
 60  60  60  60  69  84  63  91 103 105 105 108 106 106 106 104
 96  93  92  94  92  93  93  89  96  92  93  93  95  92  95  92
 92  96  97  91  91  96 101  96 107 108 108 107 105 108 108 107
107 107 106 108 110 110 105  99  95 102 108 110 110 110 110 109
109 110 109 112 112 111 108 108 106 106 108 104 105 104 107 107
107 105  99  97  99 107 108 107 106 107 105 101  90  95 105 108
107 108 107 108 105 106 107 104  92  93  95  96  99  84  91  90
 85  97  97  98  96  96  96  94  93  94  93 103  87  73  77  63
 61  60  60  66  60  60  60  60  60  60  60  60  60  60  60  60
%EOF


ENTER LOG DATE (DD/MM/YR) : 14/09/79
ENTER SITE CODE (5 CHARS) : 42072
ENTER USER CODE (4 CHARS) : 7610
 ENTER JOB CODE (3 CHARS) : 210


   DATA LOGGED :14 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 42072
SERIAL NUMBER : 1217                       JOB CODE : 210
     BASELINE : 60 DB                     USER CODE : 7610
DYNAMIC RANGE : 64 DB                     THRESHOLD : 60 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  112373
TEST DURATION =  7:46:13              STANDBY TIME =  1:33:27

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 468
PERIOD =  1 MINUTES

TIME          LEQ(A                        DOSE
HOUR    CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1      88.5       88.5          .636        .64
   2      88.2       83.6         9.683      10.32
   3     103.4       96.3        80.060      90.37
   4     106.4      100.4       120.847     211.22
   5     104.7      101.5        96.351     307.57
   6     103.9      102.0        85.566     393.14
   7     105.7      102.6       110.287     503.42
   8     100.8      102.5        44.743     548.17
MIN. COMP. =  60 DB              MAX. COMP. = 114 DB
ARITHMETIC MEAN =  92 DB
STD. DEVIATION =  17 DB
VARIANCE =  [illegible]
```

(41)

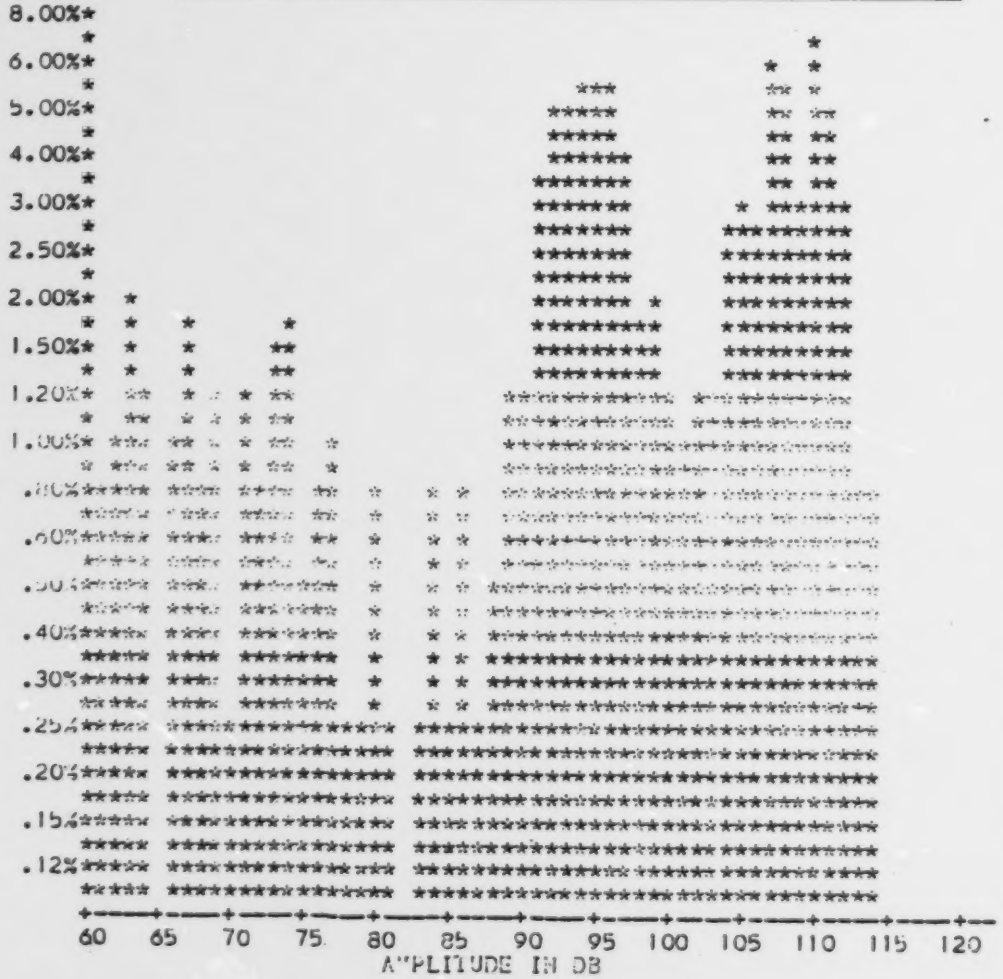
41

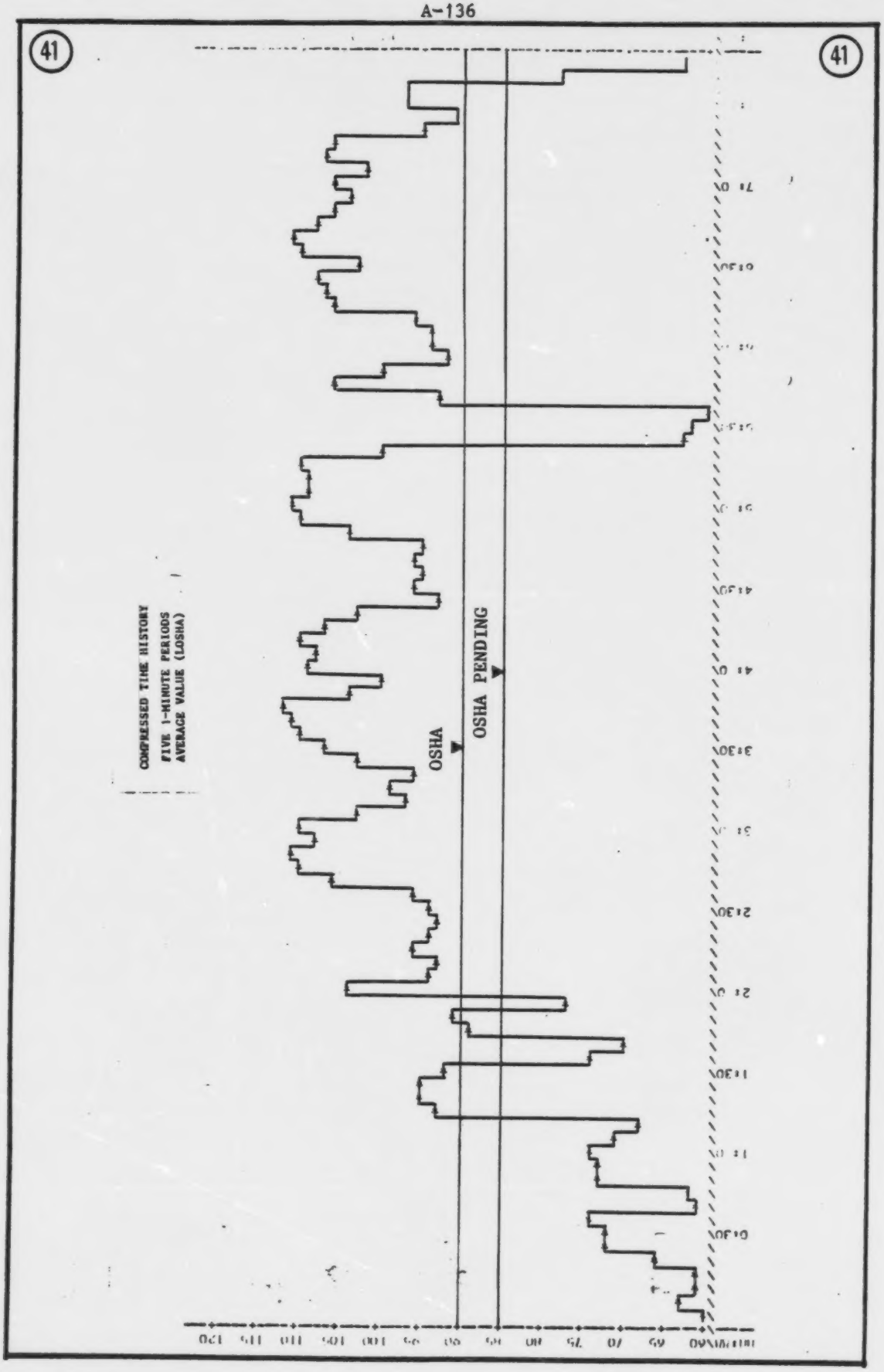
AMPLITUDE DISTRIBUTION

41

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
73	15.2	60 TO 64
19	4.0	65 TO 69
22	4.6	70 TO 74
11	2.3	75 TO 79
8	1.7	80 TO 84
12	2.5	85 TO 89
80	16.7	90 TO 94
75	15.6	95 TO 99
30	6.3	100 TO 104
84	17.5	105 TO 109
66	13.8	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




41
41
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dB(A)
60
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00

(42)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1224   60   04    4    1
    9256      11520  480
 62  60  60  64  61  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  61  60  60  61  62  73  71  74
 72  69  67  61  64  63  61  71  69  71  63  74  62  68  67  64
 [illegible]
 93  [illegible]
 99  95  95  93  93  93  95  94 103 101  96  94  95  88  94 103
 93  94  94  94  94  94  94  94  94  93  94  99  95  94 103 109
113 114 113 107  97  97 108 115 113 111 103 113 114 113 113 107
104  97 102 104 104 112 113 112 103  95  96  95  95  92  92  96
110 113 113 106 104 102 104 112 114 112 107 113 112 111 110 102
 94 101 103 101  93 103 107 110 112 113 112 111 101 112 111 104
109 100 103 111 111 107 107 104 107 111 111 113 106 110 111 111
106 110  99  92  93  93  99 103 114 107 102  97  97  99 103 102
 95  94  93  94  94  94  93  93  93  93  94  94  95  95  94  94
 95  96  94  98 103 104 107 110 111 109 112 108 111 111 112 109
111 114 110 112 114 112 111 111 106  99 103 102 110 109 108 106
106  97  95  97  96  99  98  95  95  94  94  95  95 105  93  77
 76  64  71  79  68  64  70  66  61  66  61  60  61  62  65  60
 92 100  94  90 103  98  94  95  93  93  93  94  96  95  97  95
102 109 110 108 105 104 102 106 105 106 102 108  98  95  95  95
 95  96  95  95  96  95  92  94  94 100  98  95  94  94  94  94
 99 108 103  94  94  94  92  95  94  94  99 105 109 109 110 105
112 110 110 103 102 101 101  99 108 112 110 104 108 112 110 111
111 111 112 107 109 111 107 102  95  94 106 111 109 103  93  93
 99 101 110 111 111 112 108 109 103  95  95  95  96  95  95 105
 95  93  93 101 100  89 102  98 106  94 103 106 105 107 100  96
 94  95  93  99 103 103  98  95  95  95  96  97  96  94  94  94
 94  94  97  95  97 102 101 104 108 108 106 106 109 108 104 104
105 101  99  97  97  97  97  98  96  96  97  94  95  95  95  94
 93  96  97  97  92  89  95  96  99  97  98  95  [illegible]  92  [illegible]
ADDR
```

(42)

ENTER LOG DATE (DD/MM/YR) : 24/07/79
ENTER SITE CODE (5 CHARS) : 45961
ENTER USER CODE (4 CHARS) : 4631
ENTER JOB CODE (3 CHARS) : 271

DATA LOGGED :24 JULY 1979
LOGGER : DS-301/26
SERIAL NUMBER : 1224
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

DATA ANALYZED : 17 SEPT 1979
SITE CODE : 45961
JOB CODE : 271
USER CODE : 4631
THRESHOLD : 60 DB
TOTAL SAMPLES = 11520
STANDBY TIME = [illegible]

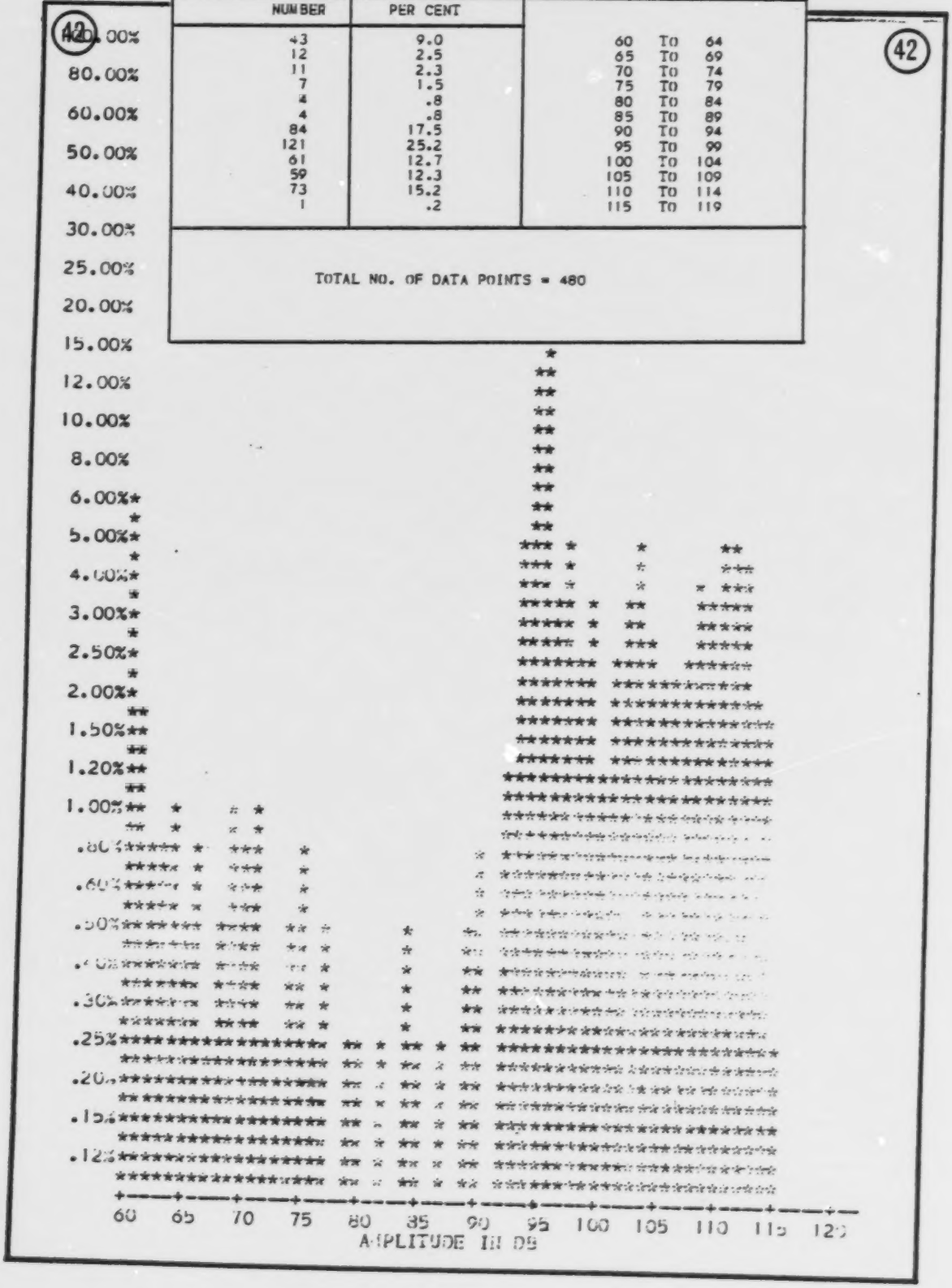
TIME HISTORY ANALYSIS

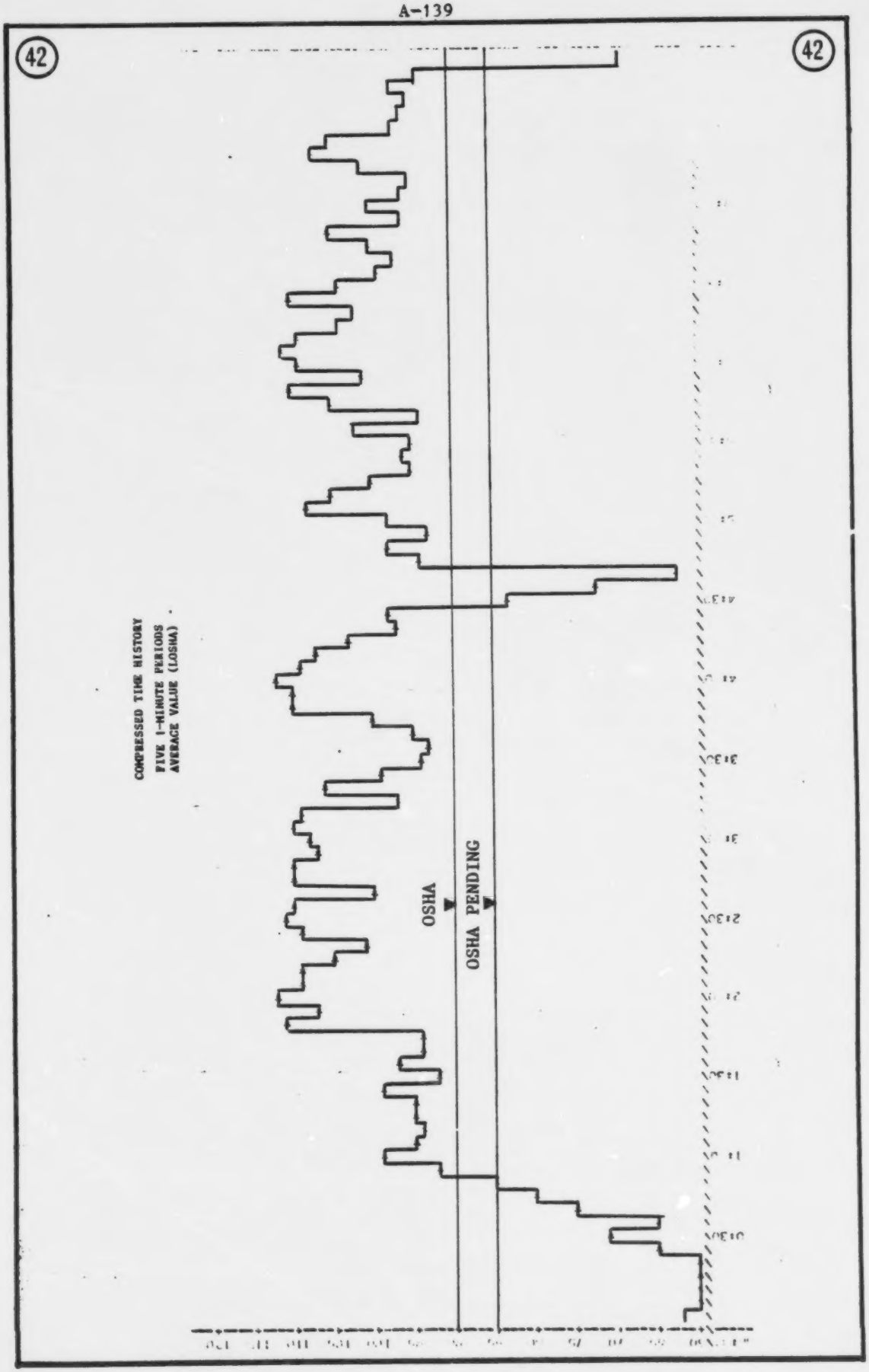
NOISE EXPOSURE LEVELS (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		LOGA	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	78.5	78.5	2.539	2.54
2	100.4	94.7	92.552	95.07
3	104.5	102.7	162.159	217.23
4	105.2	103.4	103.034	320.26
5	102.2	103.2	67.445	388.11
6	102.5	103.1	70.284	458.10
7	105.5	103.5	106.597	565.69
8	99.2	103.1	44.914	610.61

MIN. COMP. = 60 DB
MAX. COMP. = 115 DB
ARITHMETIC MEAN = 95 DB
STD. DEVIATION = 15 DB
VARIANCE =225 DB

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
43	9.0	60 To 64
12	2.5	65 To 69
11	2.3	70 To 74
7	1.5	75 To 79
4	.8	80 To 84
4	.8	85 To 89
84	17.5	90 To 94
121	25.2	95 To 99
61	12.7	100 To 104
59	12.3	105 To 109
73	15.2	110 To 114
1	.2	115 To 119
TOTAL NO. OF DATA POINTS = 480		




42
42
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(43)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1                                60      64      4      1
      22      115200   240
  63  60  60  60  60  65  72  65  60  60  60  67  60  61  60  60
  60  68  71  73  69  72  68  68  63  69  67  62  61  67  61  63
  64  67  69  73  73  62  65  69  60  65  64  76  67  76  92  93
  93  93  93  94  94  93  90  92  94  91  91  91  93  95  71  67
  75  81  82  82  84  95  96  94  98 101 100  97  97  98 100  97
  97  98  62  73  61  65  64  60  62  61  62  64  67  68  74  69
  93  94  91  92 101  82  66 102  60  63  63  60  61  60  60  60
  60  60  60  60  60  65  60  60  61  60  85  99  66  83  92  90
 106 112 116 117 113 121 122 116  95  95 119 112 112 120 120 120
 120 120 120 121 120 119 121 120 119 119 121 122 122 122 121 119
 121 120 121 122 122 121 121 121 121 120 116 108  94  94  91  92
  92  93  91  92 110 113 114 116 116 114 110 114 114 114 114 113
 112 113 114 112 113 110 112 112 112 112 112 112 112 114 115 113
 112 112 113 110  93  92 104 110 111 111 109 111 110 110 110  98
  93  95  95  94  89  60  90  73  49  60  60  60  60  60  61  63
  61  60  61  89  86  89  86  89  87  89  95  99  98  92  92  95
 100  99 101 101 103 102  97 100 101 100  99  99 100  89  86  85
  83  82  90  92  91  91  92  91  97  97  97  96  95  96  95  90
  84  85  85  85  87  89  90  94  90  69  60  70  66  60  65  66
  69  68  60  66  62  67  62  60  71  60  61  60  60  63  67  66
  60  65  67  64  66  89  92  99  90  86  86  87  86  87  87  77
  77  72  64  73  71  69  78  65  60  68  75  76  79  78  77  76
  76  77  77  81  80  78  76  73  78  82  78  74  73  79  79  79
  82  86  86  88 100  96 100 106 104  94 105 106 106 109 107 107
 107 108 108 108 106  98  87  90  99 108 108 108 101  93 108 108
 108 108 107 110 112 112 111 111 113 111 109 110 103 105 106 110
 111 110 112  95  86 111 111 112 112 110 112 109 108 106 107 112
 110 108 110 110 110 111 110 111 113 112 111 112 112 111 113 113
 110 107  90 105 108 104 109 109 112 111 112 111 111 111 111 111
 107 109 106  86  92  97  90  93  95  88  78  75  64  61  69  66
%EOF


ENTER LOG DATE (DD/MM/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4566

 ENTER JOB CODE (3 CHARS) : 272


C
    DATA LOGGED :12 JULY 1979          DATA ANALYZED : 12 SEPT 1979
         LOGGER : SE-301/26                SITE CODE : CC210
C  SERIAL NUMBER : 1221                     JOB CODE : 272
       BASELINE : 60 DB                   USER CODE : 4566
 DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0: 5

          TIME HISTORY ANALYSIS

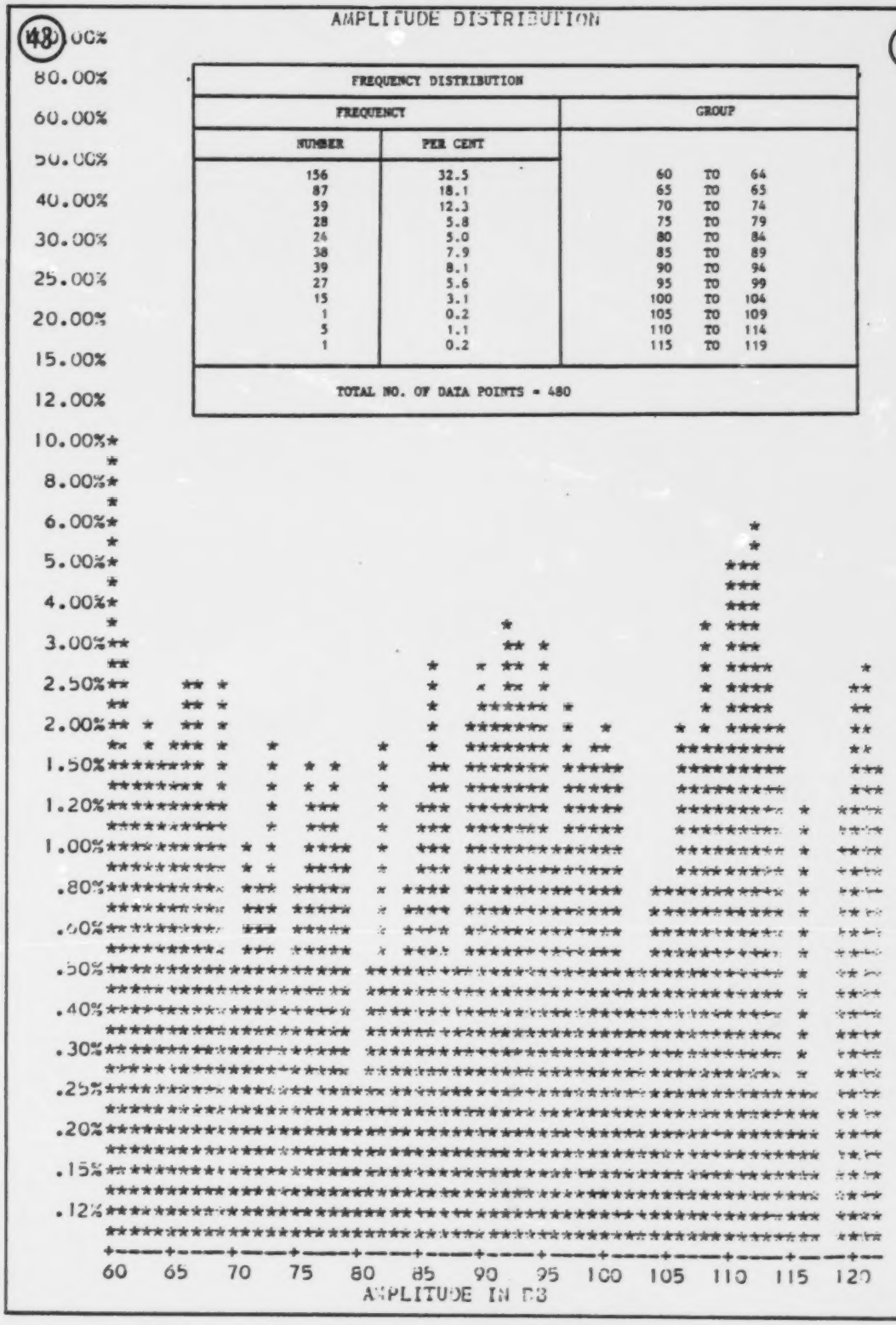
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

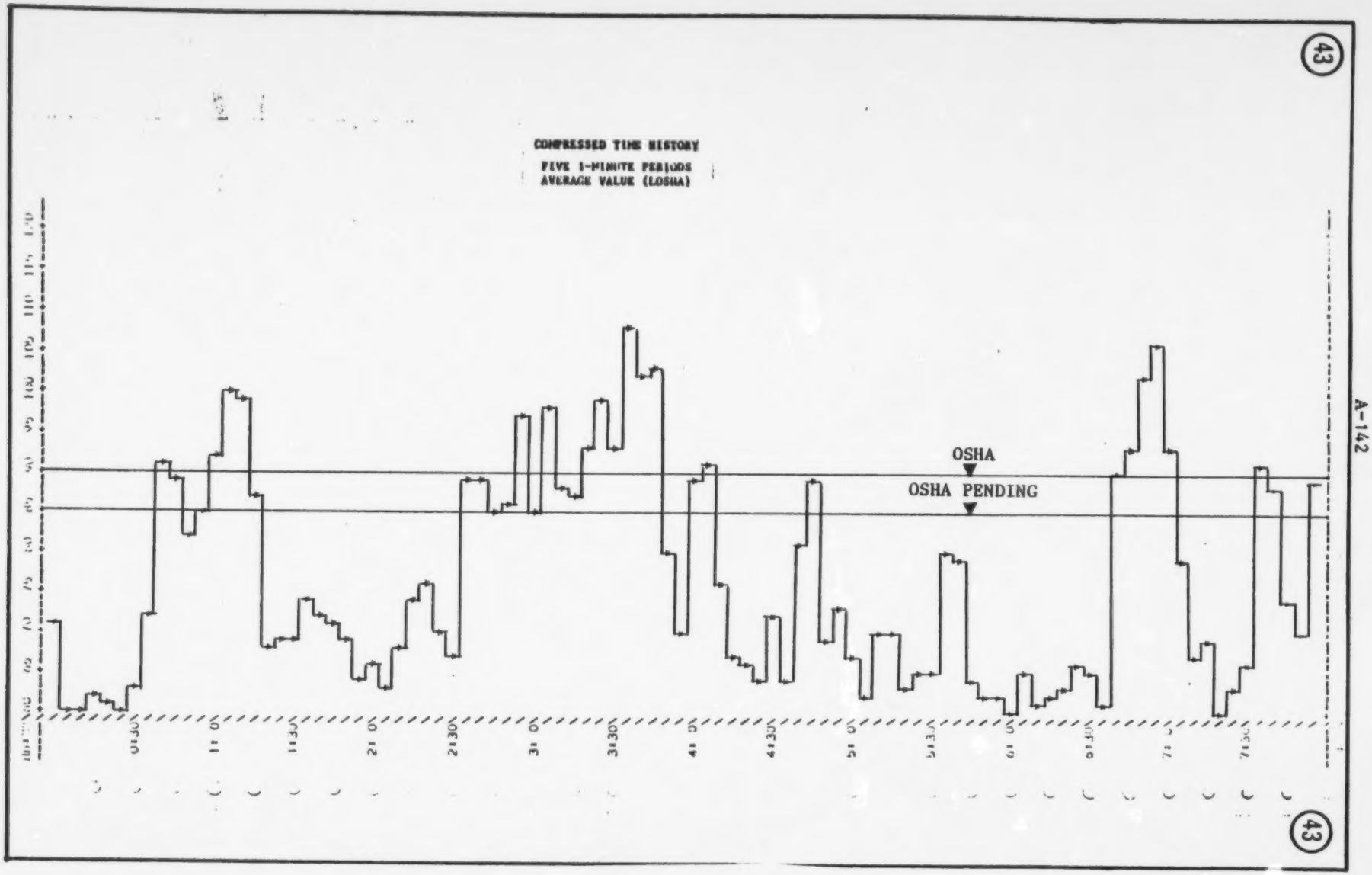
TIME          LEQ(A                          %DOSE
HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1        82.7        82.7         4.533        4.53
   2        90.1        87.3        12.721       17.25
   3       117.0       109.3       524.449      541.70
   4       109.7       109.4       192.793      734.50
   5        94.2       108.0        24.363      758.86
   6        79.8       106.7         3.021      759.87
   7       105.6       105.8       108.799      868.67
   8       158.4       106.8       159.219     1027.89
AVG. COMP. =  60 DB              AVG. COMP. = 122 DB
ARITHMETIC MEAN =  90 DB
STD. DEVIATION =  20 DB
MAXIMUM =
```

(43)

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
156	32.5	60 TO 64
87	18.1	65 TO 65
59	12.3	70 TO 74
28	5.8	75 TO 79
24	5.0	80 TO 84
38	7.9	85 TO 89
39	8.1	90 TO 94
27	5.6	95 TO 99
15	3.1	100 TO 104
1	0.2	105 TO 109
5	1.1	110 TO 114
1	0.2	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




43
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
43

(44)

```
PLACE TAPE IN READER THEN TYPE A "BRANCH" AND A "RETURN"
 1  26  60  1221    60   64    4    1
    27     11520   400
 64  70  61  60  65  66  66  73  70  62  70  62  63  70  66  60
 62  60  61  61  67  65  70  64  76  71  70  66  69  69  90  91
 92  92  97  96  96  97  95  96  97  93  95  96  93  93  93  66
 67  67  63  61  66  64  62  61  67  68  67  69  68  80  76  73
 66  76  72  69  75  73  75  66  60  61  65  67  66  66  73  69
 79  74  70  69  90  96  87  95  60  60  60  60  56  70  77  65
 80  80  78  60  65  66  69  70  79  71  60  60  60  60  60  69
 66  65  62  61  60  60  69  93  66  61  60  60  62  60  62  72
 75  90  93  94  91  90  88 105  98  88  85  83  85  86  84  85
 65  86  67  92 106 107 106 104 103  99  99  99 100 104 103 102
101  86  86  79  82  84  87  94  97  97  92  97  93  86  84  82
 80  75  83  83  88  94  87  70  92  96  92  96  81  83  83  83
 63  76  87  97  94  80  86  85  81   4  79  82  83  82  86  84
 65  83  82  80  79  83  84  83  80  66  72  70  73  72  60  62
 62  82  87  85  96  98  99  98  99  99 100 100 100 100 100 101
101 101  94  82  83  84  84  85  84  84  83  83  84  81  83  83
 83  82  84  83  84  87  93  84  68  79  72  70  65  60  60  60
 60  61  60  65  64  60  69  67  60  60  62  62  62  67  61  63
 69  66  63  72  69  71  60  65  60  61  72  61  67  71  65  62
 88  92  82  82  79  75  79  82  77  82  83  83  82  91  97  86
 85  85  85  88  88  85  85  85  87  84  85  86  87  90  93  81
 80  71  66  63  72  60  64  63  64  71  66  62  66  67  62  60
 60  75  87  99  92  99  99 100 100  97  75  60  69  69  64  60
 62  71  74  72  92  99 101 100 101 101 100  96  83  82  76  60
 60  60  60  60  60  60  60  60  60  60  64  62  66  69  82  78
 70  65  66  71  69  85  99 100  92  65  84  82  88  86  86  81
 82  82  60  80  79  81  82  76  81  81  81  81  82  77  81  81
 82  82  81  81  84  83  85  83  82  83  81  82  82  83  93  91
 80  77  63  75  76  77  78  68  73  73  95  94  90  96  97  96
 96  96  91  71  91  64  65  83  80  96  81  96  94  79  71  85
&EOF
```

(44)

```
ENTER LOG DATE (DD/MM/YR) : 13/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 4566
 ENTER JOB CODE (3 CHARS) : 272
```

C

```
    DATA LOGGED :13 JULY 1979          DATA ANALYZED : 12 SEPT 1979
         LOGGER : DS-301/26                 SITE CODE : CC210
  SERIAL NUMBER : 1221                       JOB CODE : 272
       BASELINE : 60 DB                     USER CODE : 4566
  DYNAMIC RANGE : 64 DB                      THRESHOLD : 60 DB
  SAMPLING RATE :  4/SEC              TOTAL SAMPLES =  11520
  TEST DURATION =   8: 0: 0            STANDBY TIME =   0: 0: 6
```

TIME HISTORY ANALYSIS

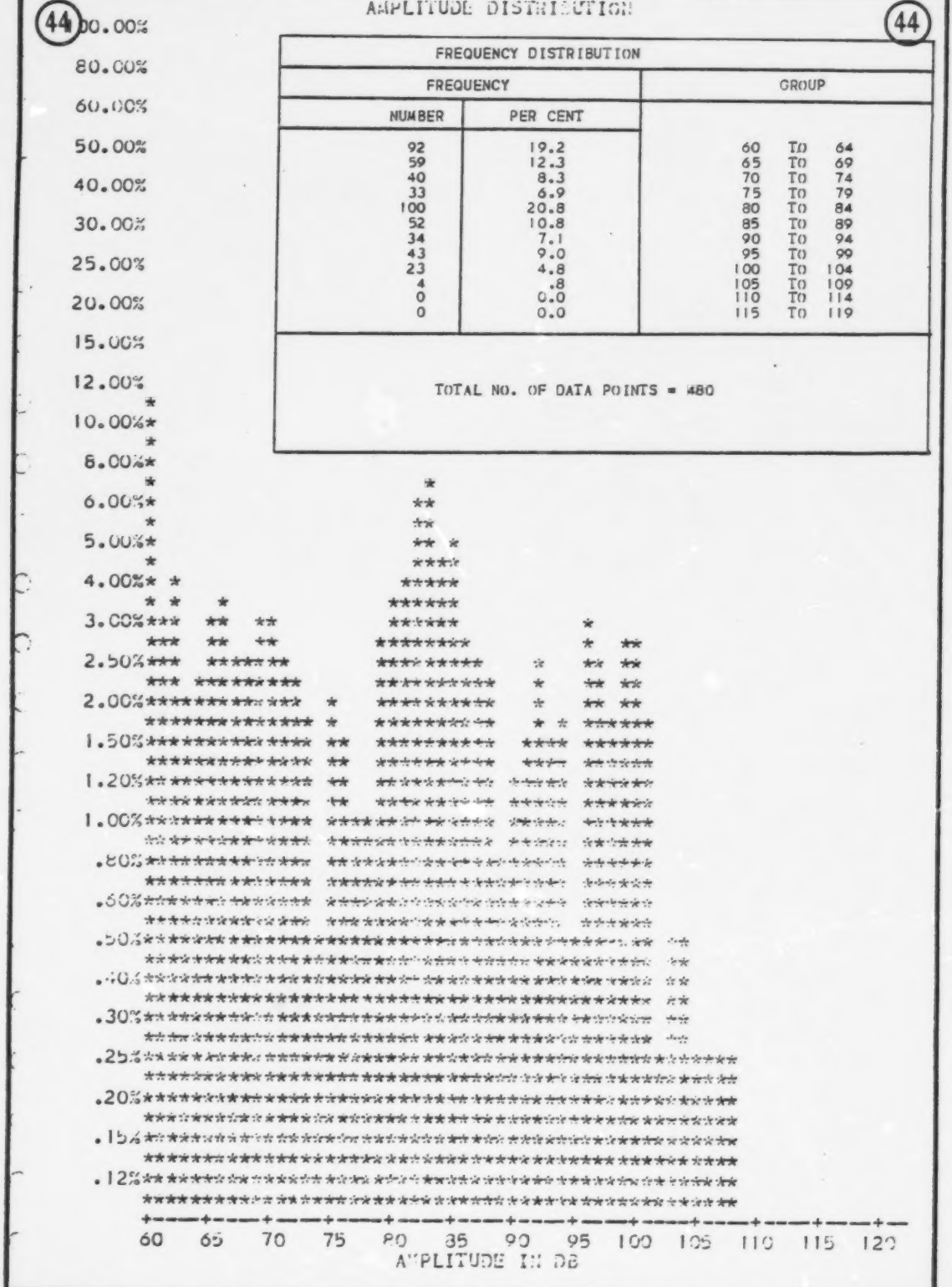
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

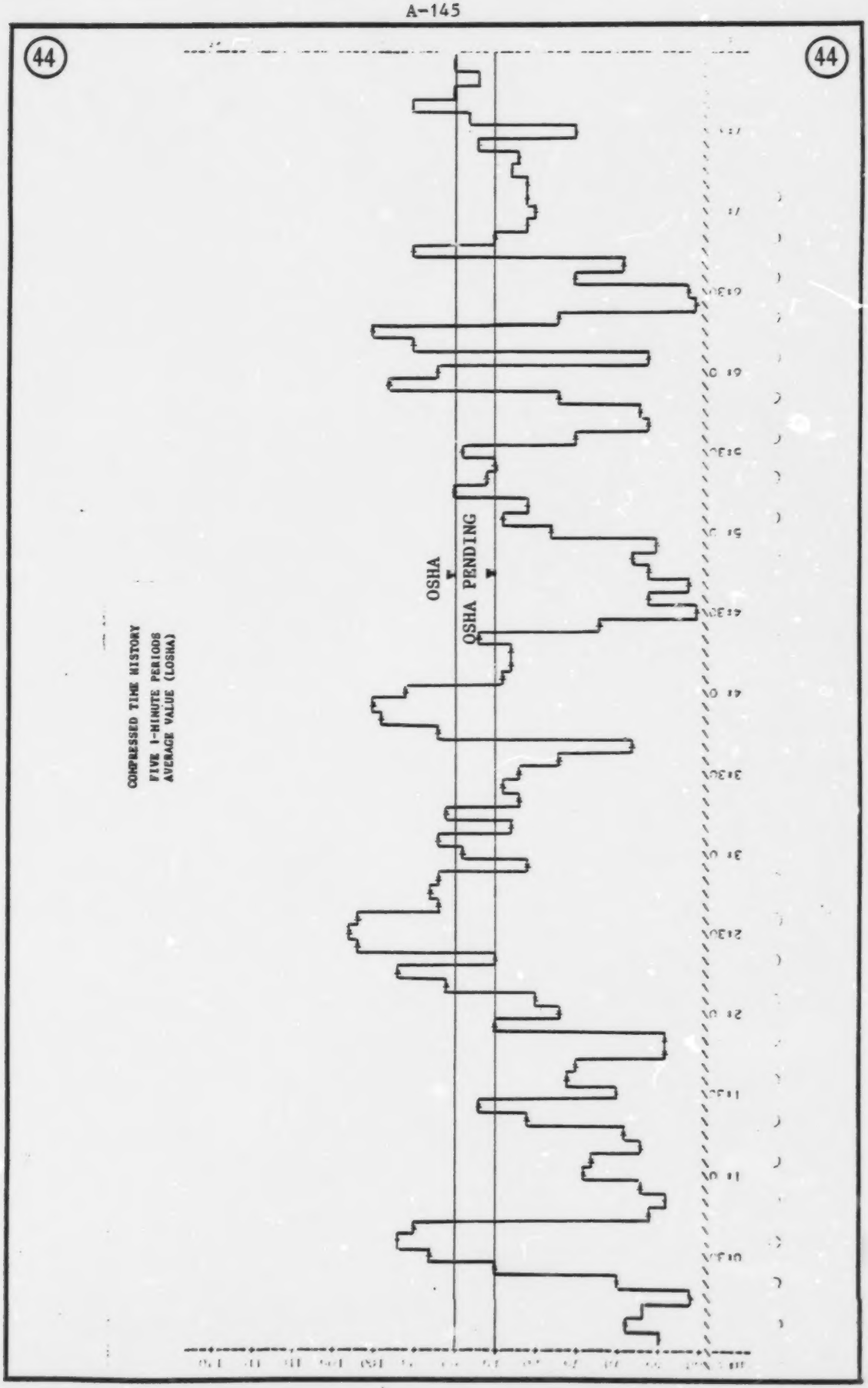
TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.2	86.2	7.359	7.36
2	77.7	83.1	2.257	9.62
3	95.3	84.6	26.087	35.70
4	91.1	90.0	14.593	50.30
5	82.6	89.1	4.369	54.70
6	89.0	88.7	7.771	62.47
7	89.1	88.8	10.977	73.45
8	89.9	88.6	.163	81.62

MIN. CONC. = 60 DB MAX. CONC. = 104 DB
ARITHMETIC MEAN = 76 DB
STD. DEVIATION = 13 D
ALTITUDE =164 FT

(44) AMPLITUDE DISTRIBUTION (44)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
92	19.2	60 TO 64
59	12.3	65 TO 69
40	8.3	70 TO 74
33	6.9	75 TO 79
100	20.8	80 TO 84
52	10.8	85 TO 89
34	7.1	90 TO 94
43	9.0	95 TO 99
23	4.8	100 TO 104
4	.8	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




44
44
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(45)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

1 26 80 1219 60 64 4 1

32 115200 480

68	71	69	80	69	67	66	66	63	73	68	67	72	77	77	78
75	94	95	94	94	94	94	95	97	96	97	96	96	96	96	95
96	96	95	97	98	97	84	94	93	85	80	84	66	61	62	60
60	62	60	60	60	67	73	71	75	82	71	71	71	66	60	60
65	95	92	74	82	91	104	93	71	67	60	63	60	60	60	60
60	62	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	61	60	60	60	60	60	61	60	67	61	60	61	60	60
60	60	60	60	60	60	60	60	60	60	60	60	68	60	60	60
60	58	60	60	60	60	60	62	60	64	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	64	61	62	63	63	65	75
76	64	60	60	62	62	62	60	63	60	93	96	94	95	95	96
96	95	94	94	94	91	90	88	90	93	90	93	93	96	95	95
94	95	95	94	95	95	94	91	92	94	95	93	93	93	94	94
94	92	60	70	70	65	60	64	60	84	94	91	90	60	60	60
62	60	60	60	64	62	60	61	60	60	89	93	95	95	95	95
94	95	93	92	93	92	92	93	91	92	92	93	92	92	92	92
69	64	60	64	65	71	101	89	83	88	89	60	60	60	60	62
60	63	69	60	60	60	68	60	60	60	60	63	71	67	60	60
61	60	60	60	60	60	60	65	60	60	60	60	60	60	66	87
96	95	84	90	91	84	83	86	81	85	94	86	93	81	60	75
82	81	86	79	62	84	95	62	64	66	86	71	70	73	77	84
81	70	64	86	85	89	94	87	80	96	87	87	73	74	84	82
82	83	81	60	78	83	86	83	83	81	62	89	92	85	80	87
77	65	72	78	86	87	90	87	78	83	84	90	91	71	71	60
77	62	60	60	60	65	76	79	60	60	60	60	60	60	60	60
62	61	60	60	60	60	60	60	60	61	63	60	60	60	60	62
62	60	88	62	86	60	60	60	85	77	94	77	86	92	96	74
60	87	80	74	60	72	81	77	85	90	90	72	70	63	65	66
75	79	75	69	70	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	72	65	60

EOF

(45)

ENTER LOG DATE (DD/MM/YR) : 18/07/79
ENTER SITE CODE (5 CHARS) : 00201
ENTER USER CODE (4 CHARS) : 4379
ENTER JOB CODE (3 CHARS) : 281

C

DATA LOGGED : 18 JULY 1979
LOGGER : 56-301/20
SERIAL NUMBER : 1219
BASELINE : 60 DB
DYNAMIC RANGE : 94 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8[illegible] : 0

DATA ANALYZED : 14 SEPT 1979
SITE CODE : 00201
JOB CODE : 281
USER CODE : 4379
THRESHOLD : [illegible] DB
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible] : 0[illegible] : 0

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
APL BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

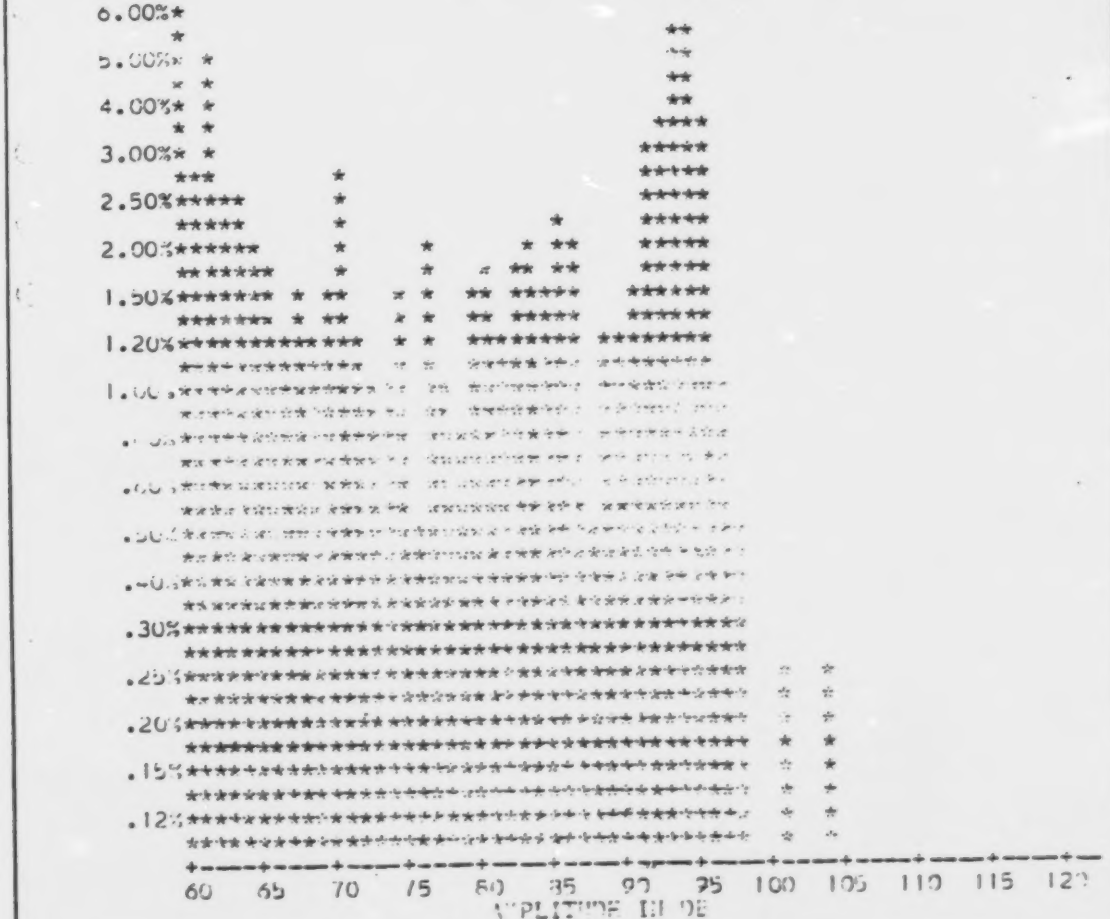
TIME	LOG-A		ANTILOG	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	89.1	89.1	11.050	11.05
2	90.1	89.9	3.156	14.20
3	82.4	84.9	4.330	18.54
4	89.5	86.4	11.697	30.24
5	83.8	86.3	6.981	37.22
6	85.3	86.1	6.560	43.78
7	78.9	85.4	2.600	46.45
8	78.3	84.8	2.482	48.93

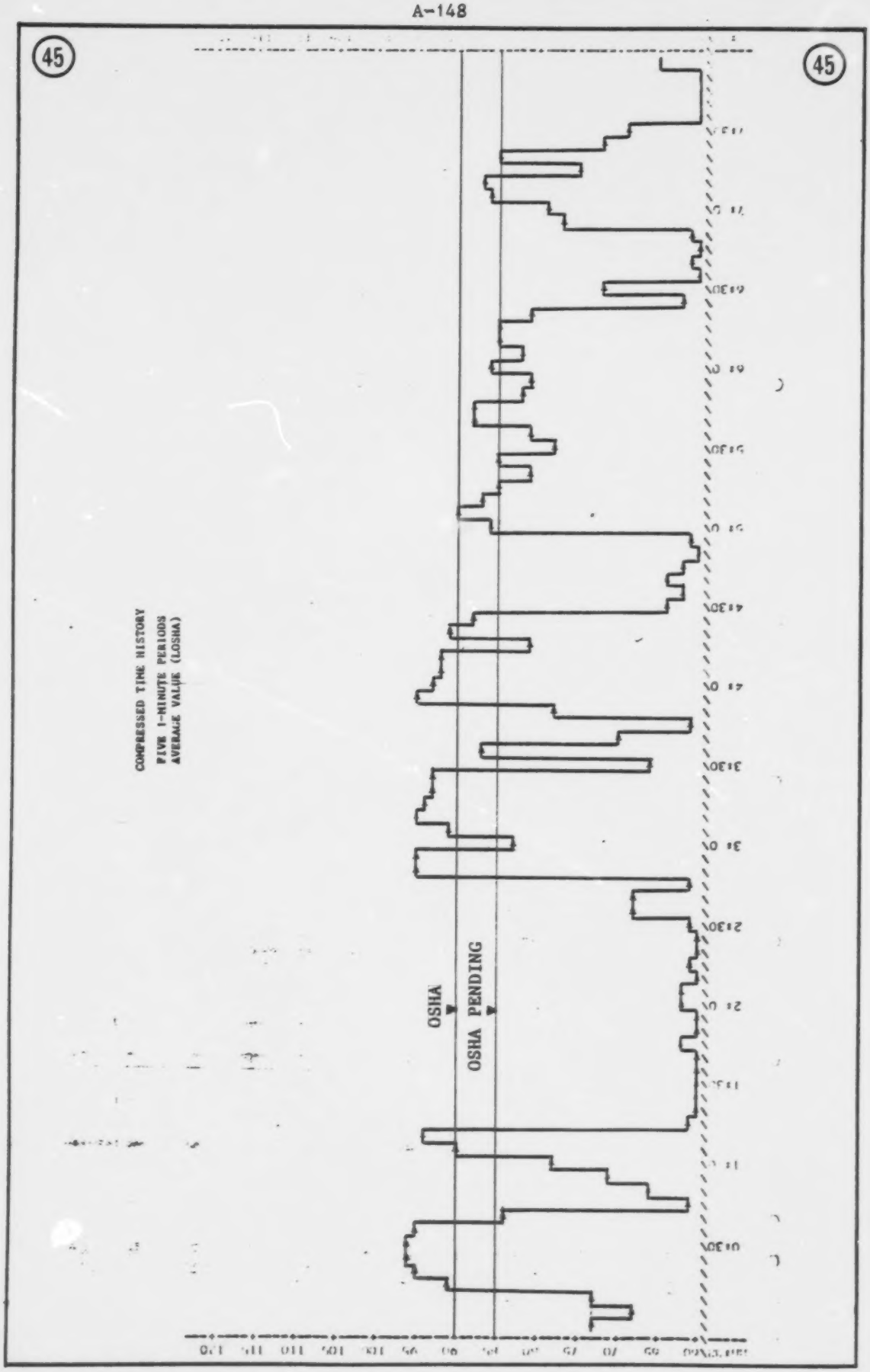
MIN. COMP. = 60 DB MAX. COMP. = 104 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 14 DB
VARIANCE = 196 DB

(45) AMPLITUDE DISTRIBUTION (45)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
229	47.7	60 TO 64
31	6.5	65 TO 69
30	6.3	70 TO 74
23	4.8	75 TO 79
33	6.9	80 TO 84
30	6.3	85 TO 89
60	12.5	90 TO 94
42	8.8	95 TO 99
2	.4	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




45
45
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(46)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1214   60   64    4    1
       81     115200  480
  66  66  63  60  74  65  61  62  61  62  65  72  60  60  66  66
  63  69  74  73  68  69  63  70  60  60  61  60  65  75  68  74
  78  67  79  84  88  87  92  92  95  86  85  89  92  89  96  96
  97  90  77  69  78  75  64  60  69  60  61  64  60  60  65  63
  63  70  70  60  60  71  62  67  68  63  64  75  73  80  82  81
  72  60  76  66  65  62  60  70  63  70  60  60  68  76  82  77
  70  75  60  64  60  60  71  77  95 102 100  65  77  72  80  74
  79  84  75  75  69  78  78  90  95  95  92  93  96  97  80  93
 106 110 110 107  93  64  67  93 111  76  78  73  66  72 106 107
  79  68  71  63  75  77  77  71  76  78  77  91 103  77  68  66
  66  82  75  68  87 109 105  67  74  72  77 100 102  96 110  95
 103  96 108  77  69  72  94  70  72  75  95  86  64  75  70  60
  60  70  76  79  70  69  62  60  72  67  64  60  62  64  91  97
  71  82  94  96  94  82  72  77 103 105 102  83 101 102 100 105
  73  73  71 102 100 104  99 101 100 104 106  72  88  88  70 101
  76  74  74  83  75  76  79  65  68  73  79  81  76  80  82  84
  74  69  77  76  66  68  76  72  60  70  80  71 102 101 102 105
  78  71  68  68  60  65  67  60  63  64  60  60  60  60  60  60
  61  66  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  64  60  60  60  73  66  61  63  66  70  68  60  60
  60  60  60  60  75  94  99 109  74  69  74  72  94  88  90  86
  64  60  60  61  60  64  74  74  68  71  75  73  80  73  90 101
 104  98  83  86  84  89  95 100  82  93  76  70  70  66  60  63
  73  74  66  75  68  73  78  82  61  81  85  74  65  94  70  73
  77  62  67  76  75  74  76  67  70  83  87  82  60  71  77  77
  81  78  79  78  60  63  64  60  68  73  73  60  60  60  75  61
  75  66  75  71  78  76  65  80  67  81  77  79  78  70  81  77
  76  76  72  80  65  78  79  72  60  60  72  74  73  68  61  87
  83  80  78  73  83  79  83  83  83  81  85  81  83  81  78  73
%EOF


ENTER LOG DATE (DD/MM/YR) : 15/08/79

ENTER SITE CODE (5 CHARS) : 98013
ENTER USER CODE (4 CHARS) : 4624
 ENTER JOB CODE (3 CHARS) : DAM


   DATA LOGGED :15  AUG 1979          DATA ANALYZED : 21 SEPT 1979
       LOGGER : DB-301/26                SITE CODE : 98013
SERIAL NUMBER : 1214                      JOB CODE : DAM
     BASELINE : 60 DB                    USER CODE : 4624
DYNAMIC RANGE : 64 DB                    THRESHOLD :  80 Db
SAMPLING RATE :  4/SEC             TOTAL SAMPLES =  115200
TEST DURATION =   8H 0M 0          STANDBY TIME =   0H 0M20

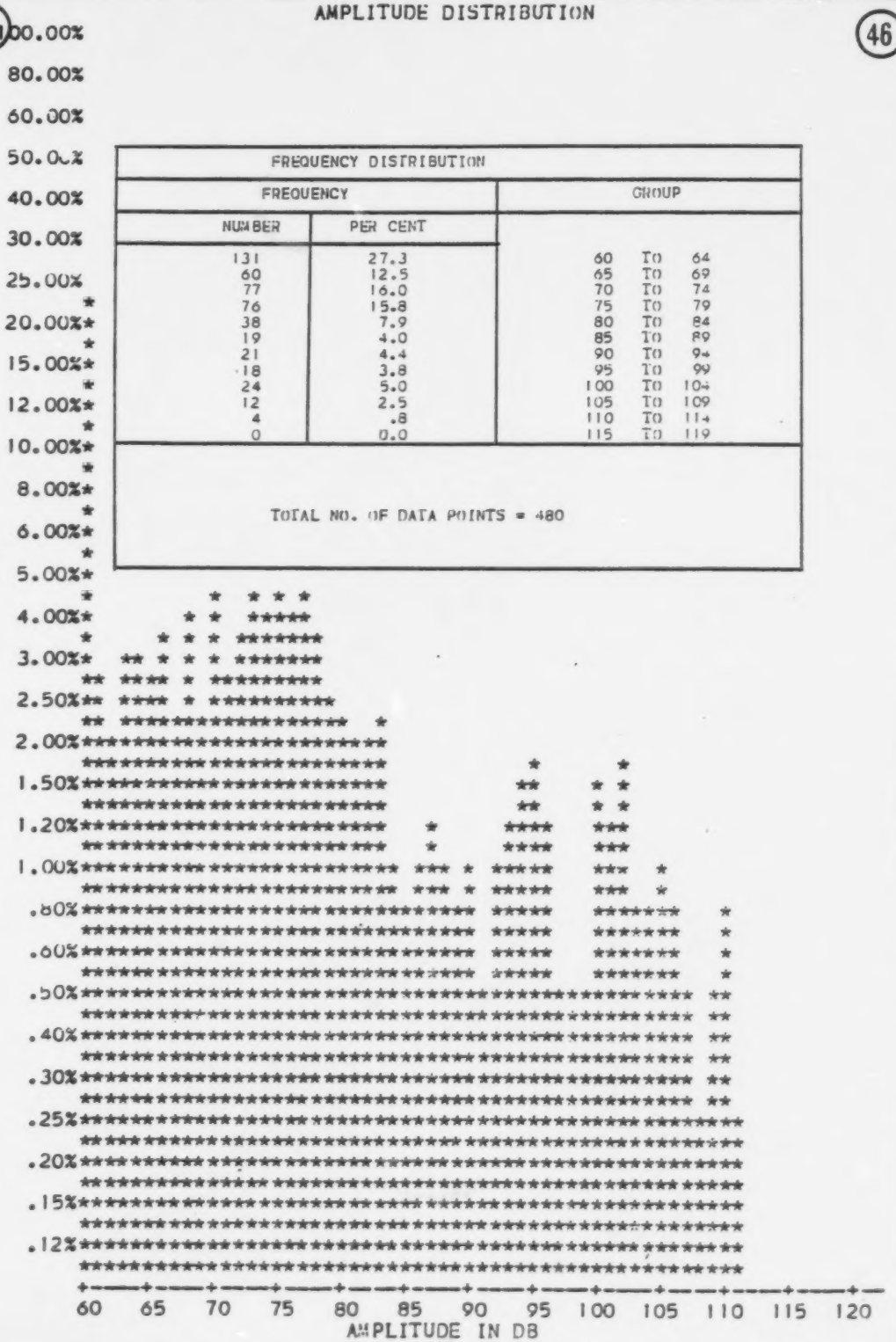

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          DOSE                      DOSE
HOUR    CURRENT  CUMULATIVE       CURRENT  CUMULATIVE
   1      82.6      82.6          4.457      4.46
   2      81.0      81.8          3.599      8.06
   3      98.2      91.7         39.098     47.15
   4      94.3      92.4         22.700     69.85
   5      84.6      91.4          5.877     75.73
   6      83.7      90.5          5.185     80.92
   7      85.9      90.0          7.107     88.02
   8      76.9      89.2          2.031     90.05
MIN. COMP. =  60 DB              MAX. COMP. = 111 DB
ARITHMETIC MEAN =  74 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```

(46)

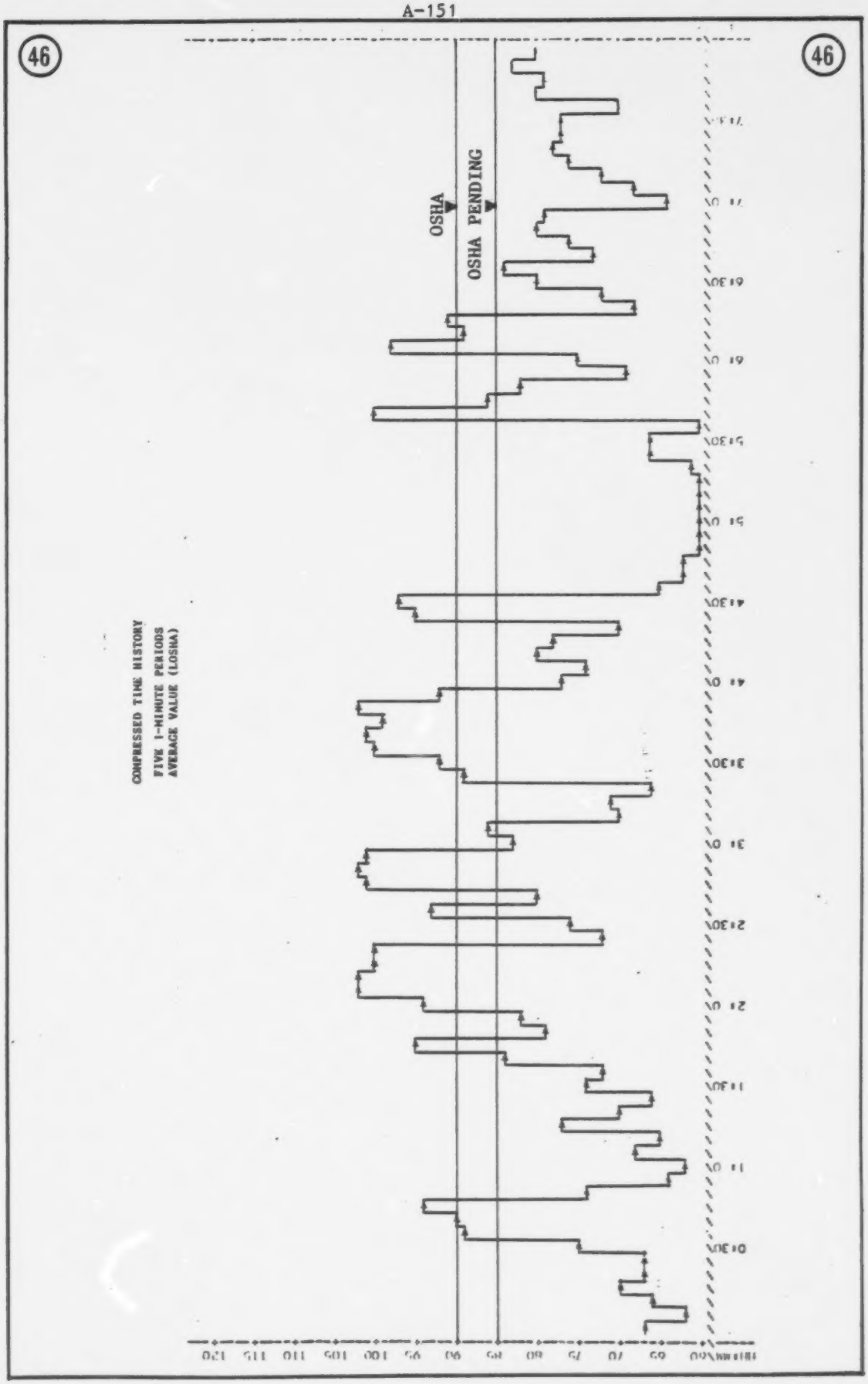
46 AMPLITUDE DISTRIBUTION 46



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
131	27.3	60 To 64
60	12.5	65 To 69
77	16.0	70 To 74
76	15.8	75 To 79
38	7.9	80 To 84
19	4.0	85 To 89
21	4.4	90 To 94
18	3.8	95 To 99
24	5.0	100 To 104
12	2.5	105 To 109
4	.8	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480


46
46
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
dBA
120
115
110
105
100
95
90
85
80
75
70
65
60
0:30
1
1:30
2
2:30
3
3:30
4
4:30
5
5:30
6
6:30
7

(47)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(47)

```
 1  26  80  1224   60   64    4    1
     30      115200  480
 60  65  66  63  73  61  62  60  60  60  60  62  60  60  60  60
 61  60  60  60  66  63  61  62  82 100  97  85  83  84  88  88
 94  95 100  84  84  85  94  99  98  94  98  94  95  87  81  88
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  64  62  68  60  60  60  60  60  60  60
 71  75  72  76  75  77  80  61  60  68  64  72  61  60  60  60
 68  60  73  68  65  69  66  68  67  61  67  62  63  74  65  60
 60  60  60  60  60  63  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  61  60  60  60  61  61  74  72
 60  75  80  65  71  67  60  93  75  66  60  70  60  60  60  74
 60  60  60  60  67  66  66  65  60  71  70  75  75  78  76  73
 77  60  74  62  71  61  61  61  73  66  66  67  68  70  79  77
 73  81  82  81  75  63  61  78  77  66  79  72  76  63  65  66
 64  71  74  68  72  71  64  71  60  73  73  73  67  68  72  72
 71  65  64  66  61  60  60  68  67  71  77  75  66  65  74  62
 67  68  69  62  61  60  70  68  68  72  60  62  73  67  71  60
 69  68  64  72  72  66  61  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  63  62  61  67  68  72  73
 60  76  67  60  75  60  61  69  65  95  60  68  66  74  76  62
 60  60  72  66  60  60 104 105 105 110 108 106 111  99  61  82
 84  94 107 104  83  70  68  99 109 110 110 111 108 106 111  99
105 110 110 110 109 113  89 110 103  93 105 110 109 110 108 110
107 108  95  78  67  69  80 103 112 111 111 110 114  96 109 105
 93  83  87 104 110 111 108 109 110 107 109  85  99  75  84  83
 93 102 110 110 112 109 107 108 113 104  75  97 100 111 111 112
112 110 109  87 113  95  91  82  94 104 104 110 110 108 105 111
106 102  99 101  88  83  72  76  73  69  60  60  60  60  60  77
 83  60  60  64  66  72  67  61  72  84  66  74  71  78  62  72
 81  83  74  78  93  95  83  86  93  86  74  65  76  71  66  74
*EOF
```

ENTER LOG DATE (DD/MM/YR) : 13/08/79

ENTER SITE CODE (5 CHARS) : 98013

ENTER USER CODE (4 CHARS) : 4624
ENTER JOB CODE (3 CHARS) : DRA

DATA LOGGED :13 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1224
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8! 0: 0

DATA ANALYZED : 21 SEPT 1979
SITE CODE : 98011
JOB CODE : DRA
USER CODE : 4624
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0: 0: 7

TIME HISTORY ANALYSIS

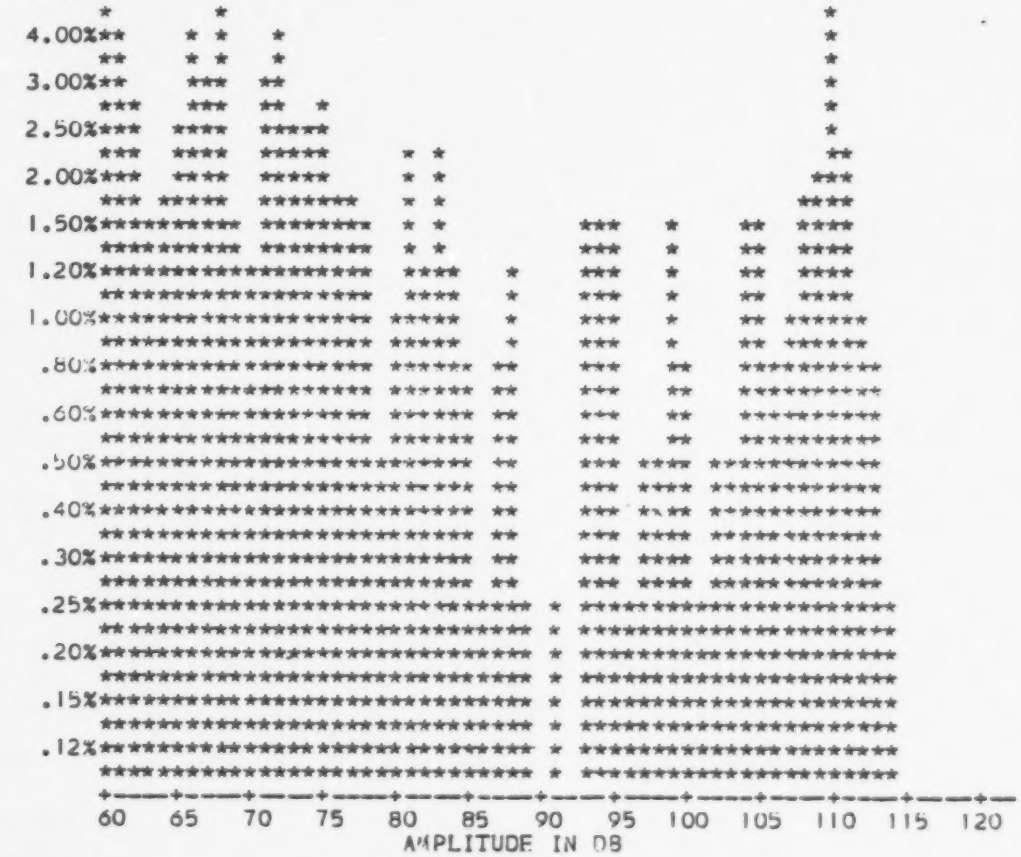
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% LOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

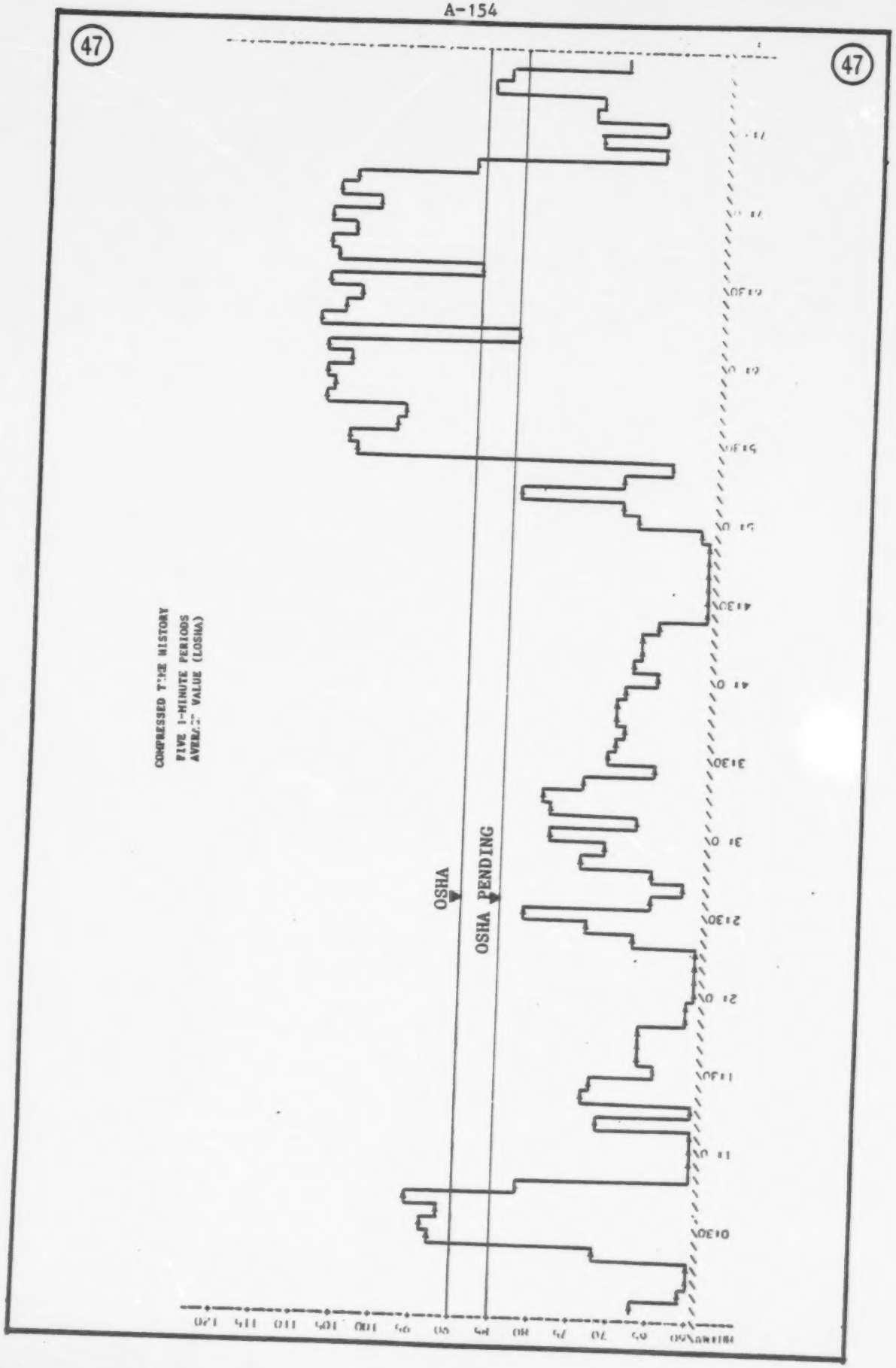
TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	80.1	80.1	1.942	1.94
2	67.6	82.2	.562	2.50
3	71.0	80.0	.900	3.40
4	74.2	78.9	1.397	10.80
5	64.0	77.6	.341	11.14
6	102.3	90.4	68.327	79.47
7	106.7	96.2	126.290	205.75
8	96.5	96.2	30.544	236.29

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 75 DB
STD. DEVIATION = 17 DB
VARIANCE =249 DB
MAX. COMP. = 114 DB

(47) AMPLITUDE DISTRIBUTION (47)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
179	37.3	60 TO 64
63	13.1	65 TO 69
53	11.0	70 TO 74
33	6.9	75 TO 79
32	6.7	80 TO 84
13	2.7	85 TO 89
13	2.7	90 TO 94
17	3.5	95 TO 99
14	2.9	100 TO 104
28	5.8	105 TO 109
35	7.3	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




47
47
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
11:30
21:30
31:30
41:30
51:30
MINUTES
60
70
80
90
100
110
120

(48)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1218   60   64    4    1
     102    115200  480
  60  60  60  60  60  66  60  61  60  60  61  62  64  67  65  68
  71  68  64  68  66  68  60  60  60  68  73  68  61  60  61  69
  75  63  71  86  90  87  89  82  90 100  98  89  87  86  87  93
  95  96  97  85  95  88  95  96  97  97  97  94  94  91  97  97
  93  98  89  96  92  97  93  85  81  81  70  74  73  61  75  75
  68  73  76  74  77  71  67  67  64  71  67  64  60  61  62  63
  60  60  60  60  60  60  60  60  60  68  64  66  73  67  62  67
  72  62  61  60  62  65  60  66  63  60  60  61  66  65  61  62
  63  60  65  62  66  61  66  60  65  63  69  60  78  70  61  66
  95  96 102  96  93 100  99  92 100  95  94  89  61  60  63  68
  71  73  69  69  64  61  65  61  60  60  66  60  67  61  62  61
  61  74  60  60  61  66  63  62  60  61  78  90 101  91  85  72
  60  67  89  94  70  60  61  65  60  69  62  62  67  70  60  62
  60  60  64  70  60  66  62  61  62  66  61  68  60  60  71  60
  60  62  60  62  61  67  68  63  61  62  60  63  60  60  60  60
  60  60  60  60  68  67  73  60  69  62  60  61  65  76  78  78
  78  76  62  68  68 100  96  64  60  67  60  61  63  61  60  60
  62  60  60  60  60  60  60  61  60  60  60  60  60  60  62  61
  60  62  60  70  69 100 105  83  60  60  60  66  62  73  60  60
  66  93 103  99 102  99  68  60  62  67  65  65  69  60  68  76
  71  74  72  67  68  61  75  71  71  60  60  60  60  60  60  60
  62  70  60  64  60  60  60  66  60  60  60  60  60  60  60  60
  61  60  60  62  60  60  60  68  60  66  66  60  60  67  67  61
  61  64  63  61  61  63  60  60  63  64  62  60  68  60  62  61
  69  64  62  63  62  60  61  66  64  60  64  60  60  60  60  64
  62  68  62  60  63  60  71  69  60  70  62  69  74  70  70  70
  61  64  63  68  65  67  71  74  69  66  60  62  60  65  67  65
  60  60  60  60  70  70  67  69  72  73  62  60  62  60  61  60
  61  61  63  65  60  74  68  76  60  65  61  60  60  60  60  60
  60  61  60  60  60  61  60  64  66  74  85  85  89  98  97  96
%EOF
```

(48)

```
ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 32950
ENTER USER CODE (4 CHARS) : 4769
 ENTER JOB CODE (3 CHARS) : DRL
```

```
   DATA LOGGED :14  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/2S                SITE CODE : 32950
 SERIAL NUMBER : 1218                      JOB CODE : DRL
      BASELINE : 60 DB                    USER CODE : 4769
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC            TOTAL SAMPLES =  115200
 TEST DURATION =   0: 0: 0          STANDBY TIME =   0: 0:25
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	OSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	87.3	87.3	8.563	8.56
2	83.6	85.7	5.182	13.74
3	85.6	85.6	6.754	20.50
4	78.1	84.4	2.394	22.89
5	82.3	84.0	4.324	27.22
6	82.7	83.8	4.520	31.74
7	64.6	82.8	.371	32.11
8	78.2	82.3	2.446	34.55

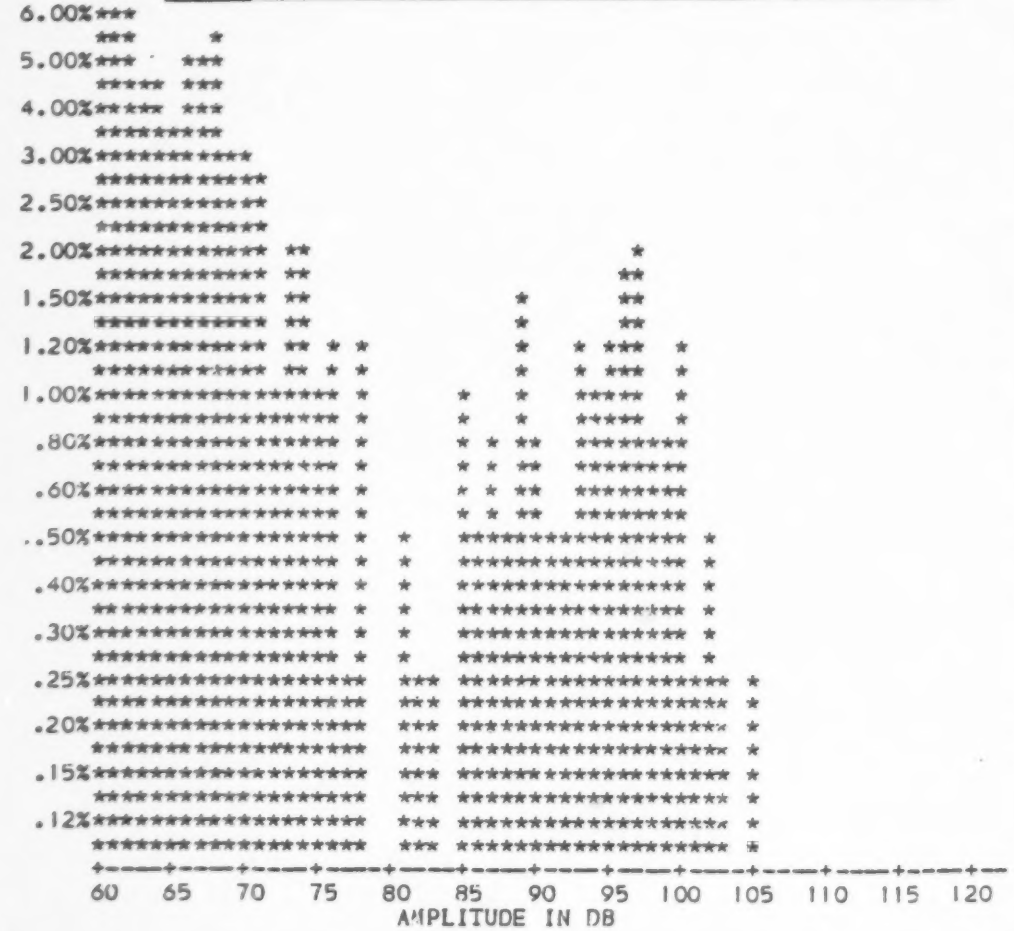
```
MIN. COMP. =  60 DB                MAX. COMP. = 105 DB
ARITHMETIC MEAN =  68 DB
STD. DEVIATION =  12 DB
VARIANCE =144 DB
```

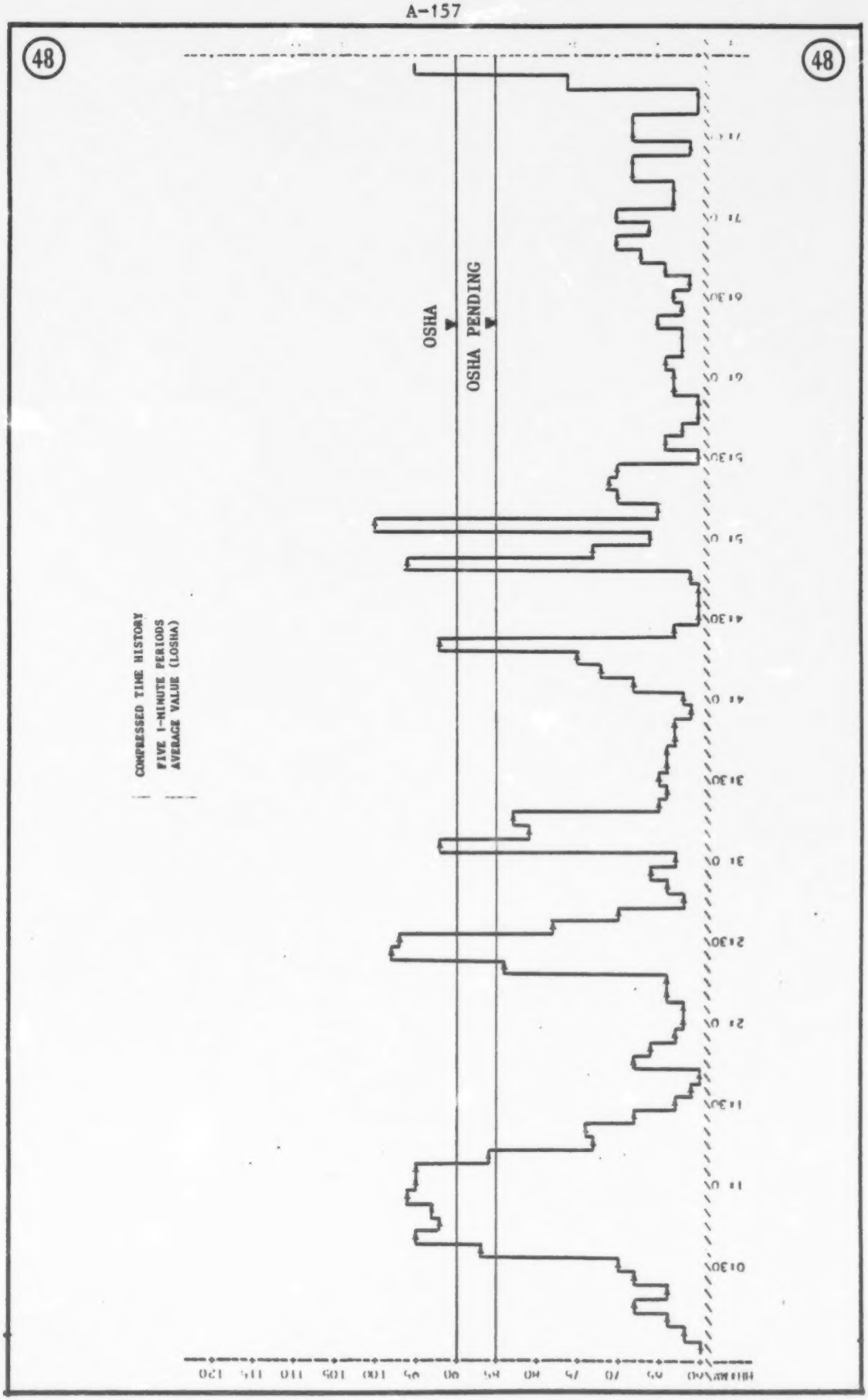
AMPLITUDE DISTRIBUTION

(48) (48)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
259	54.0	60 TO 64
89	18.5	65 TO 69
44	9.2	70 TO 74
15	3.1	75 TO 79
4	.8	80 TO 84
17	3.5	85 TO 89
16	3.3	90 TO 94
26	5.4	95 TO 99
9	1.9	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




48
48
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
dBA
120
115
110
105
100
95
90
85
80
75
70
65
60
01:30
11
11:30
12
12:30
13
13:30
14
14:30
15
15:30
16
16:30
17
17:30

(49)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226   60   64    4    1
    2407     115200  480
 61  66  60  61  66  71  70  67  65  60  60  60  66  71  71  73
 69  68  60  60  60  68  67  68  66  62  62  60  64  70  62  60
 68  62  68  60  60  60  69  64  70  60  83  86  92  88  93  95
 95  90  90  89  93  95  92  95  95  93  94  93  94  94  97  80
 75  73  71  60  60  62  61  60  60  60  60  61  65  60  62  70
 63  66  60  60  60  60  60  64  60  60  60  60  60  60  63  69
 71  66  69  65  88 102  83  75  82  83  83  76  79  80  67  61
 60  76  81  77  82  82  79  87  81  81  84  97 108  97  89  98
104 107 102 105 106 109 107 110 108 105 107 105 109 108 105 109
108 107 108 103  83  84  90  80 108 105 105 104 105 108 108 110
106 107 106 101 111  99  88  80  89  92  96  69  67  63  70  77
 70  70  71  69  82  82  81  79  79  81  82  81  81  81  86 106
105 107 107  99  97 107 106 106 103 109 106 107 109  90 108 105
106 107 102  83  84  83  97  88  99  90 101 101 100 101 103 105
102 102 104  76  67  74  80  74  72  70  67  64  64  67  63  62
 71  67  83  82  92  80  76  67  62  63  60  60  60  60  60  60
 60  60  60  60  61  64  64  60  60  60  60  60  61  63  60  61
 60  60  60  60  62  62  63  62  61  64  63  60  61  63  66  68
 60  71  73  67  68  68  92 100  84  84  84  84  87  84 103 108
102 104  98 109 109 107 107 107 104 107 105 107 106 109 107 108
108 107 106 107 106 106 109 108 109 107 107 107 106 107 106 107
106 106 107 108 107 106 106 105 107 105 105 106 107 105 107 107
105 103 102 103 103 103 106 104 107 104 106 105 102  87  80  83
 82  92  89  93  94  93  94  94  92  94  92  93  90  91  93  93
 93  98 107  93  75  79  66  93  97  76  64  61  78  71  70  69
 66  64  86  85  90  80  64  60  70  75  84  80  61  63  62  68
 71  73  75  73  68  70  61  69  70  79  75  72  60  63  65  62
 60  64  64  69  69  72  68  61  74  70  73  98  88  65  61  61
 69  60  60  61  60  62  60  63  62  60  63  73  78  66  63  61
 60  60  60  60  60  60  60  63  61  72  81  90  97  92  94  99
%EOF
```

(49)

```
ENTER LOG DATE (DD/MM/YR) : 15/08/79
ENTER SITE CODE (5 CHARS) : 32950
ENTER USER CODE (4 CHARS) : 4766
 ENTER JOB CODE (3 CHARS) : DRI
```

```
   DATA LOGGED :15  AUG 1979          DATA ANALYZED : 21 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 32950
SERIAL NUMBER : 1226                       JOB CODE : DRI
      BASELINE : 60 DB                    USER CODE : 4766
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                  TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0               STANDBY TIME =   0:10: 1
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

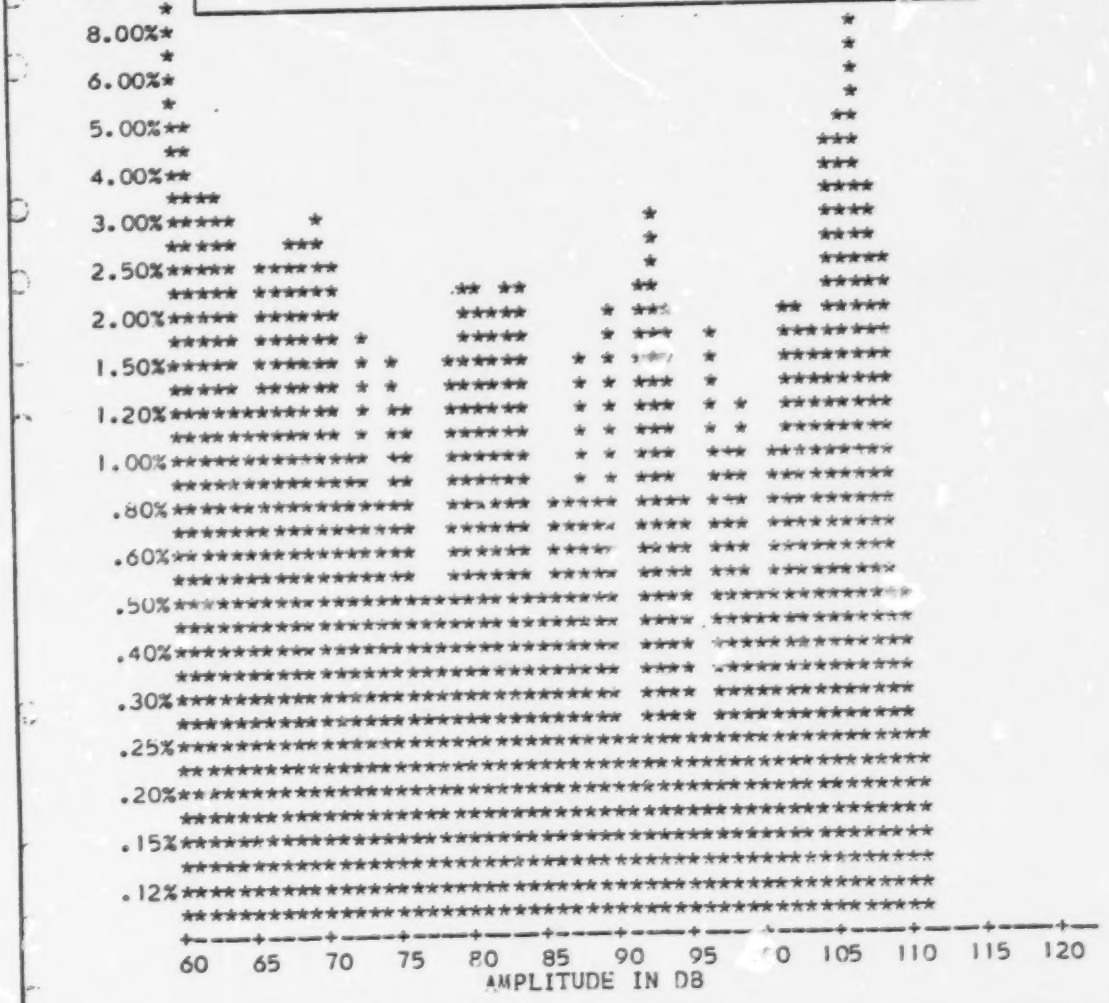
TIME	OSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	84.1	84.1	5.517	5.52
2	81.3	82.8	3.733	9.25
3	103.3	96.1	78.563	87.81
4	99.9	97.3	49.172	136.99
5	77.6	95.8	2.237	139.22
6	106.0	98.8	115.626	254.85
7	92.8	98.2	18.468	273.32
8	80.7	97.3	3.440	276.76

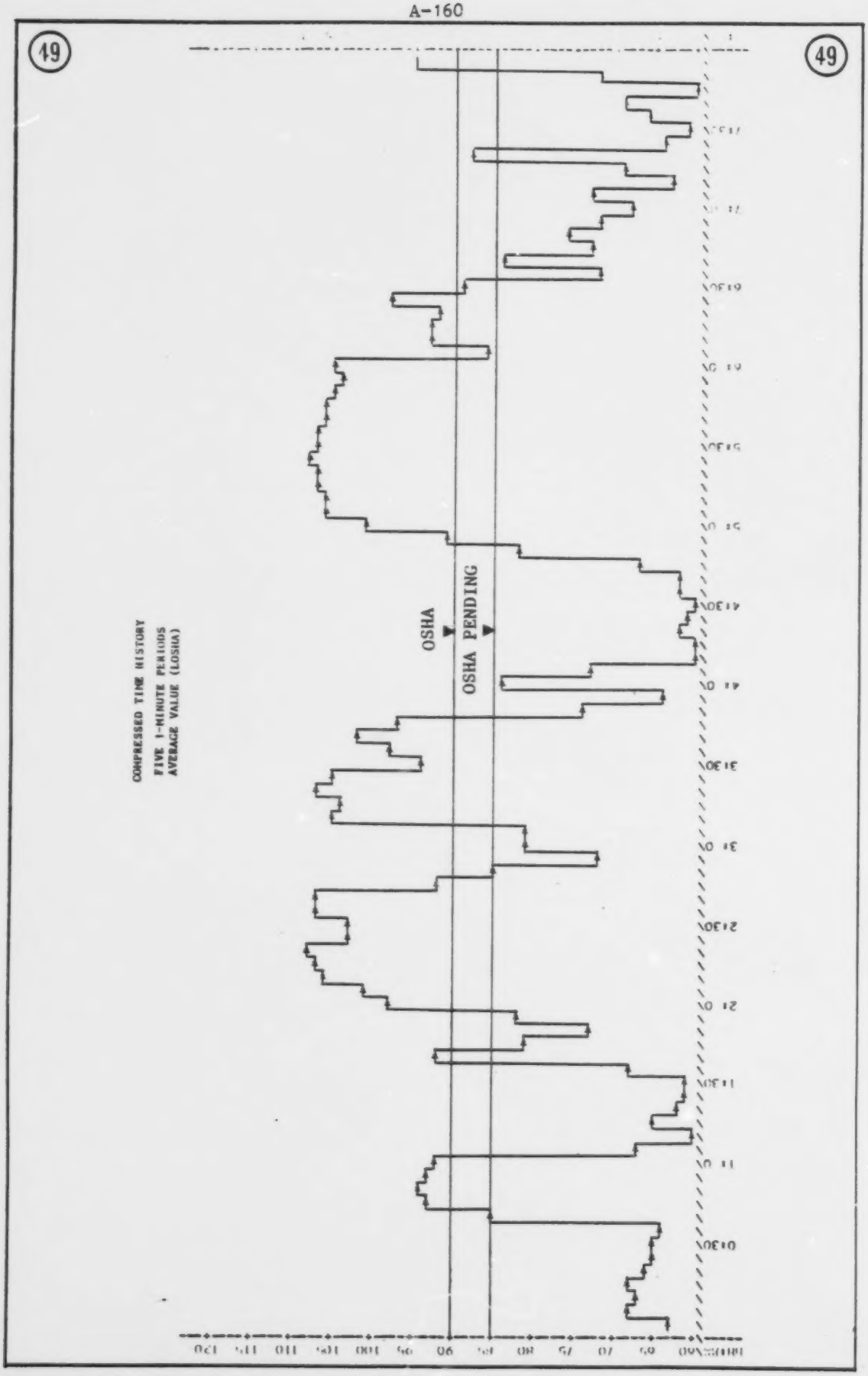
MIN. COMP. = 60 DB MAX. COMP. = 111 DB
ARITHMETIC MEAN = 81 DB
STD. DEVIATION = 18 DB
VARIANCE =324 DB

AMPLITUDE DISTRIBUTION

(49) (49)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
131	27.3	60 TO 64
47	9.8	65 TO 69
37	7.7	70 TO 74
21	4.4	75 TO 79
44	9.2	80 TO 84
17	3.5	85 TO 89
38	7.9	90 TO 94
20	4.2	95 TO 99
29	6.0	100 TO 104
93	19.4	105 TO 109
3	.6	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




19
49
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0130
11 00
1130
21 00
2130
31 00
3130
41 00
4130
51 00
5130
61 00
6130
71 00
7130
80
85
90
95
100
105
110
115
120

(50)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226   60   64    4    1
     986     115200  480
  70  62  61  61  62  60  62  60  60  68  66  60  60  68  63  68
  62  65  71  64  63  69  61  69  60  60  60  61  63  63  66  85
  98  97  87  84  84  90  88  96  96  98  91  86  87  91  97  96
  92  97  94  92  88  70  92  86  91  97  95  93  86  93  93  83
  78  96  96  94  96  92  93  93  96  89  60  60  63  72  67  65
  60  60  66  60  61  61  60  60  60  83  95  60  63  71  69  61
  60  85  81  63  62  72  62  69  60  61  60  61  62  62  62  73
  60  62  69  71  60  87  60  61  60  60  60  60  60  60  60  60
  60  60  60  73  83  74  60  61  63  60  60  60  60  82  81  85
  82  78  76  88  84  83  62  80  83  80  60  60  80  81  79  84
  85  86  78  77  77  71  65  73  62  60  72  71  70  74  66  67
  67  70  77  78  65  69  71  84  83  87  97  98  97  97  96  96
  96 106 108  99 107 106  99  98 104 108 103  99  98 107 107 100
 106 106 105 101 107 106 101 104 106 105 103  99 107 104 100  98
  98  98  98  98  98  98  99  98  97  97  97  96 103 107 100 105
 106 104  96 107 106 103 106 109 106 103  97 108 107 107  99 105
 107 107 106  98 110 107 106 101 106 107 104  84  69  63  63  60
  60  60  62  60  60  60  60  60  60  60  60  66  60  60  60  60
  60  60  60  60  61  60  96  98  96  77  60  60  81  95  95  99
  98  98  98  98  98  98  98  98  96  96  97 105 107 101 105 105
 102 107 107 105 103 107 107 104 107 107 107 102 108 108 107 105
 106 107 107 103 104 107 103  99  98  97  98  98  98  97  97  97
 107 101 105 102 107 106 101 107 106 104 103 110 108 107 102 108
 106 106 104 105 106 106 104 106 106 106 106  97  97  98  97  99
  98  98  96  97 105 106 100 106 105  98 108 106  99 104 109 106
 102 105 107 106 101 107 107 106 101 107 106 102  97  98  97  97
  98  97  97  96  96  97 108 104 105 106 102 108 107 103 109 109
 108 100 106 107 107 104 104 111 108 108  97 110 109 107 101  98
  97  97  98  98  97  99  91  84  84  84  85  84  85  82  79  65
  63  67  65  70  75  68  91  96  96  95  95  91  99  97  91  97
%EOF


ENTER LOG DATE (DD/MM/YR) : 13/08/79
ENTER SITE CODE (5 CHARS) : 32950

ENTER USER CODE (4 CHARS) : 7745

 ENTER JOB CODE (3 CHARS) : DGM


    DATA LOGGED :13  AUG 1979          DATA ANALYZED : 21 SEPT 1979
         LOGGER : DB-301/26                SITE CODE : 32950
SERIAL NUMBER : 1226                       JOB CODE : DGM
       BASELINE : 60 DB                    USER CODE : 7745
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 4: 6

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

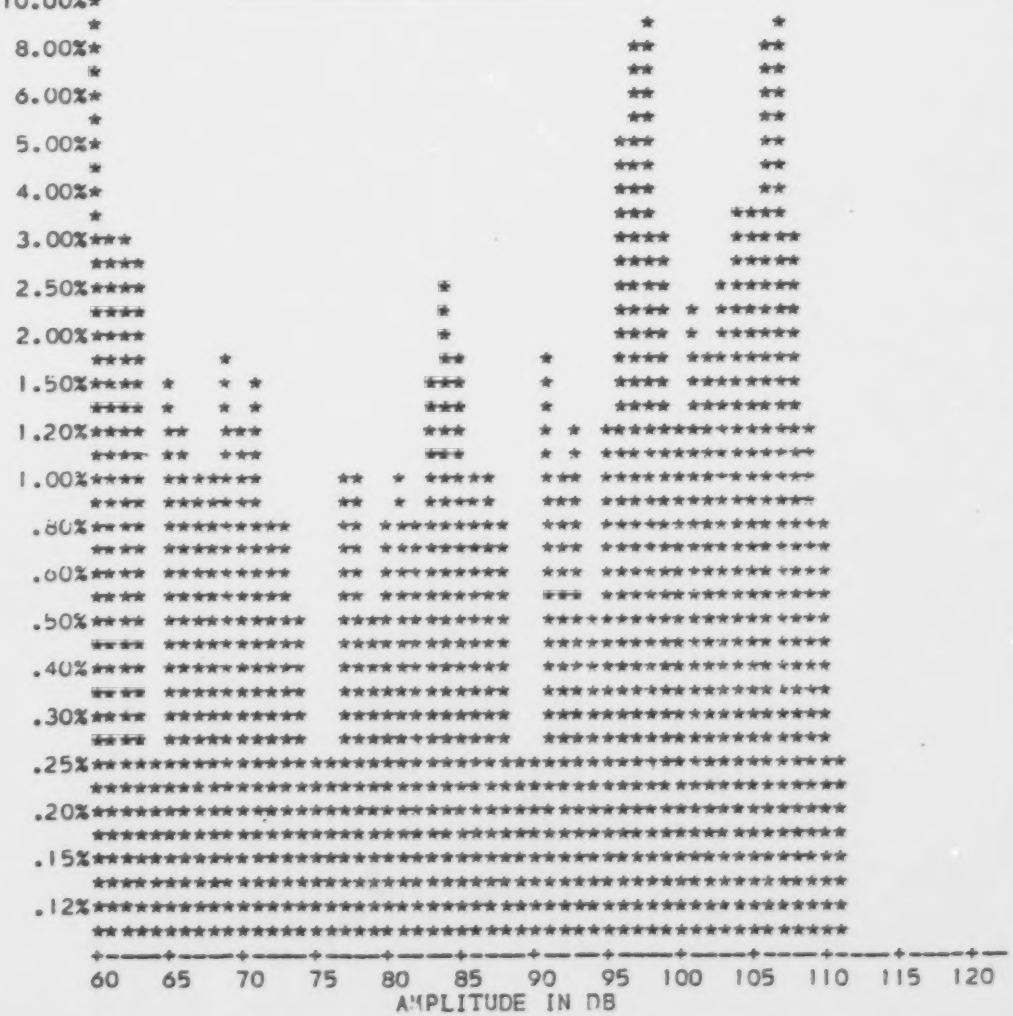
TIME          LOSHA                    %DOSE
HOUR    CURRENT  CUMULATIVE     CURRENT  CUMULATIVE
   1       87.7       87.7       9.058       9.06
   2       83.8       86.0       5.284      14.34
   3       76.3       84.0       1.882      16.22
   4      101.7       93.4      63.418      79.64
   5      100.0       95.3      49.817     129.46
   6      103.2       97.3      78.047     207.51
   7      103.9       98.7      86.367     293.87
   8      101.6       99.2      62.478     356.35
MIN. COMP. =  60 DB              MAX. COMP. = 111 DB
ARITHMETIC MEAN =  87 DB
STD. DEVIATION =  18 DB
VARIANCE =324 DB
```

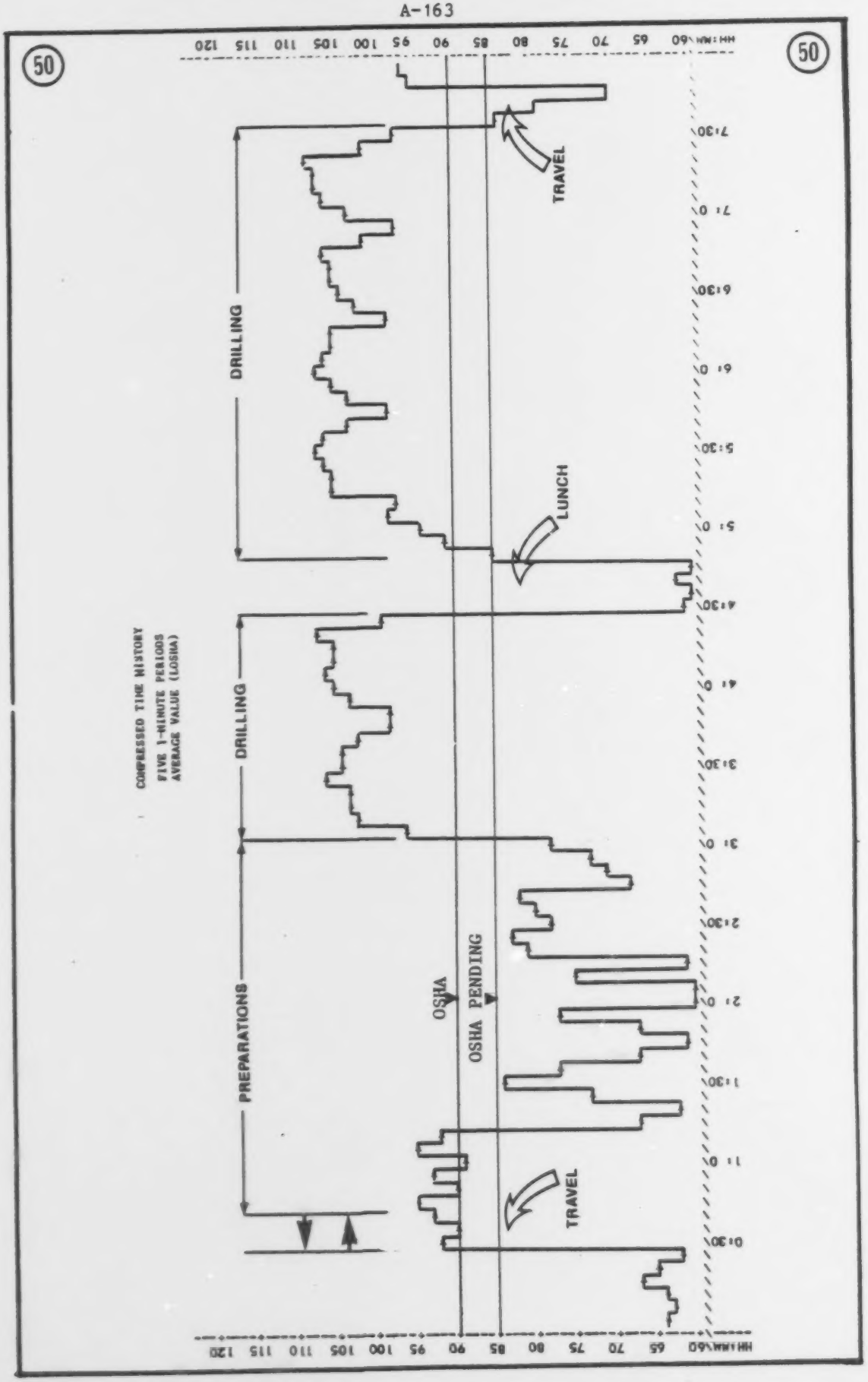
(50)

50

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
101	21.0	60 TO 64
26	5.4	65 TO 69
19	4.0	70 TO 74
12	2.5	75 TO 79
26	5.4	80 TO 84
19	4.0	85 TO 89
19	4.0	90 TO 94
106	22.1	95 TO 99
45	9.4	100 TO 104
103	21.5	105 TO 109
4	.8	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




50
50
HH:MM\60 65 70 75 80 85 90 95 100 105 110 115 120
7:30
7: 0
6:30
6: 0
5:30
5: 0
4:30
4: 0
3:30
3: 0
2:30
2: 0
1:30
1: 0
0:30
TRAVEL
DRILLING
LUNCH
DRILLING
PREPARATIONS
OSHA
OSHA PENDING
TRAVEL
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(51)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(51)

```
  1  26  80  1219    60    64     4     1
    107     115200   480
 60  61  60  60  60  60  60  60  61  61  60  60  60  60  60  63
 62  64  65  61  71  63  63  61  63  60  62  60  62  60  60  60
 60  60  62  60  60  61  75  81  81  80  79  82  98 100  86  89
 82  86  85  96  96  96  92  92  89  93  96 100  95  98  92  97
 92  79  60  60  60  60  60  60  60  60  60  61  60  60  72  60
 60  71  96  97  91  92  87  89  92  95 101  87  98  96 108 115
113 115 115 112 115 114 113 116 112 110 112 112 109 111 105 105
105 111 112 112 116 107 102  91  98  95  89  95  84  83  84  84
 86  85  89  89  85  88  85  85  86  87  98  86  85  83  84  84
 83  95  85  96  91  85  96  96  87  96  89  90  93  88  96  97
 96  94  89  93  92  96  90  93 100  91  93 105 108 109  94  98
103  95 101 111 111 113 112 107 113 109 107 112 113 111 111 106
110 109 107 101 104 106 107 106 105 106 106 106 105 104 104 103
106 106 105 103 102 107 107 105 103 102 102 101  87  87  90  98
 99  95  87  87  88  92  88  93  95  92  87  86  97  94  86  94
 88  87  92  96  87  88  94  97  91  89  90  89  94  95  88  89
 89  92  94  94  94  88  91  82  60  61  60  61  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  61
 65  60  60  60  60  60  60  60  65  64  60  60  60  60  60  60
 60  60  60  60  62  60  60  60  61  60  60  60  60  60  60  60
 60  60  60  60  62  60  60  60  60  60  69  60  63  60  63  62
 60  91  85  83 100 101  91  98 108 109 107  96  99  92  83  85
 84  85  83  84  85  91  90  83  85  99 106 107 106 106 104  94
106 104 103 101 101  99 101 107 108 106 101 102  96  93 104 108
109 108 107 109 107 107 108 106 109 107 107 105 102 101  90  89
 93  97  93  87  91  90  86  95  96  99  96  97  94  86  89  95
 91  95  97  90  62  68  90  92  95  97  94  96  95  93  92  86
$EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 35950
ENTER USER CODE (4 CHARS) : 4486
 ENTER JOB CODE (3 CHARS) : DGM
```

```
   DATA LOGGED :14  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : 35950
SERIAL NUMBER : 1219                       JOB CODE : DGM
      BASELINE : 60 DB                    USER CODE : 4486
DYNAMIC RANGE : 54 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0:26
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGA		NOISE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.3	85.3	0.538	6.54
2	106.1	101.5	115.794	122.33
3	95.7	100.0	27.438	149.77
4	104.8	101.5	97.174	246.94
5	85.1	100.1	6.314	253.26
6	60.4	98.8	.206	253.46
7	96.2	98.5	29.635	283.10
8	100.9	98.8	56.533	339.63

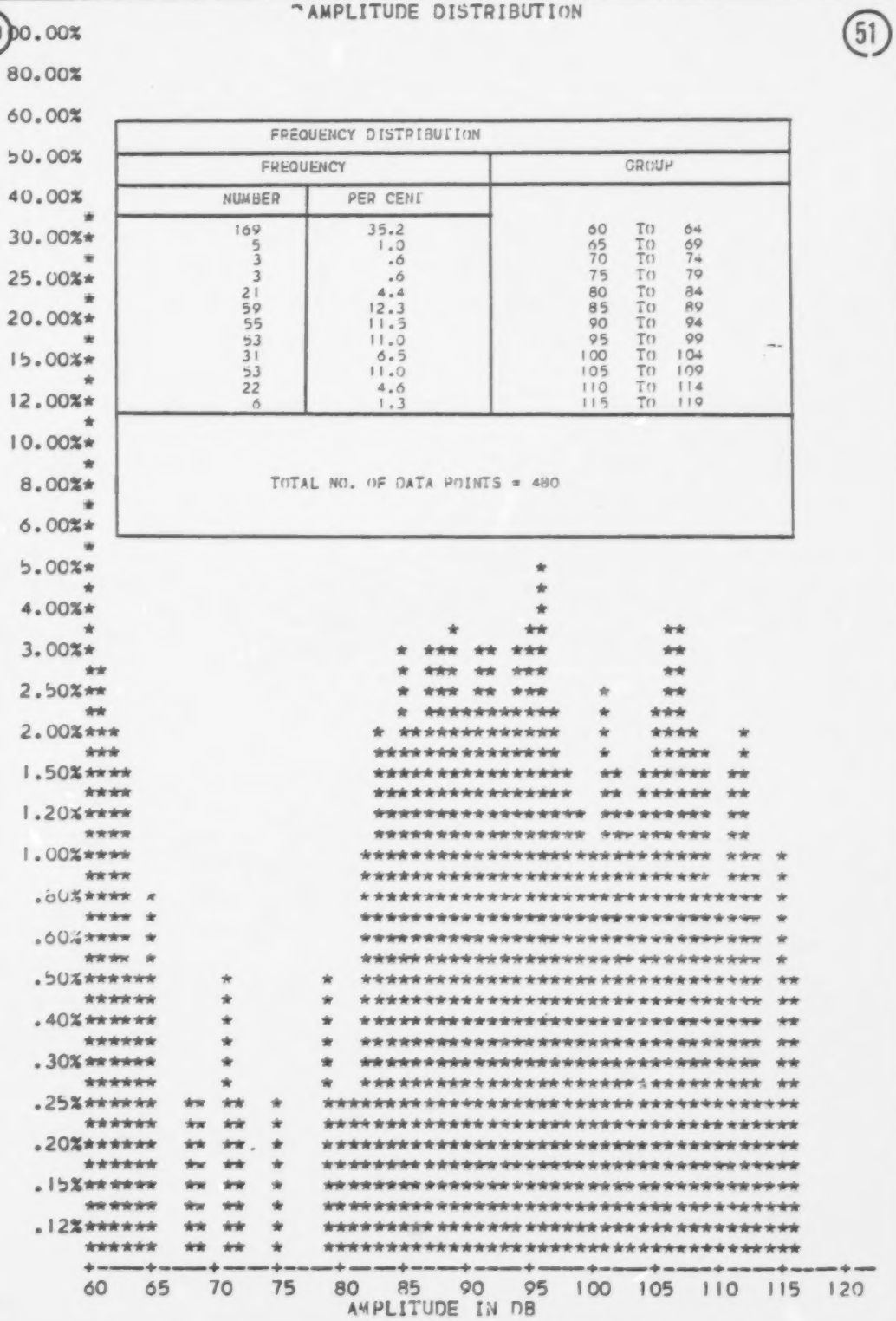
```
MIN. COMP. =  60 DB                MAX. COMP. = 116 DB
ARITHMETIC MEAN =  83 DB
STD. DEVIATION =  10 DB
VARIANCE =101 DB
```

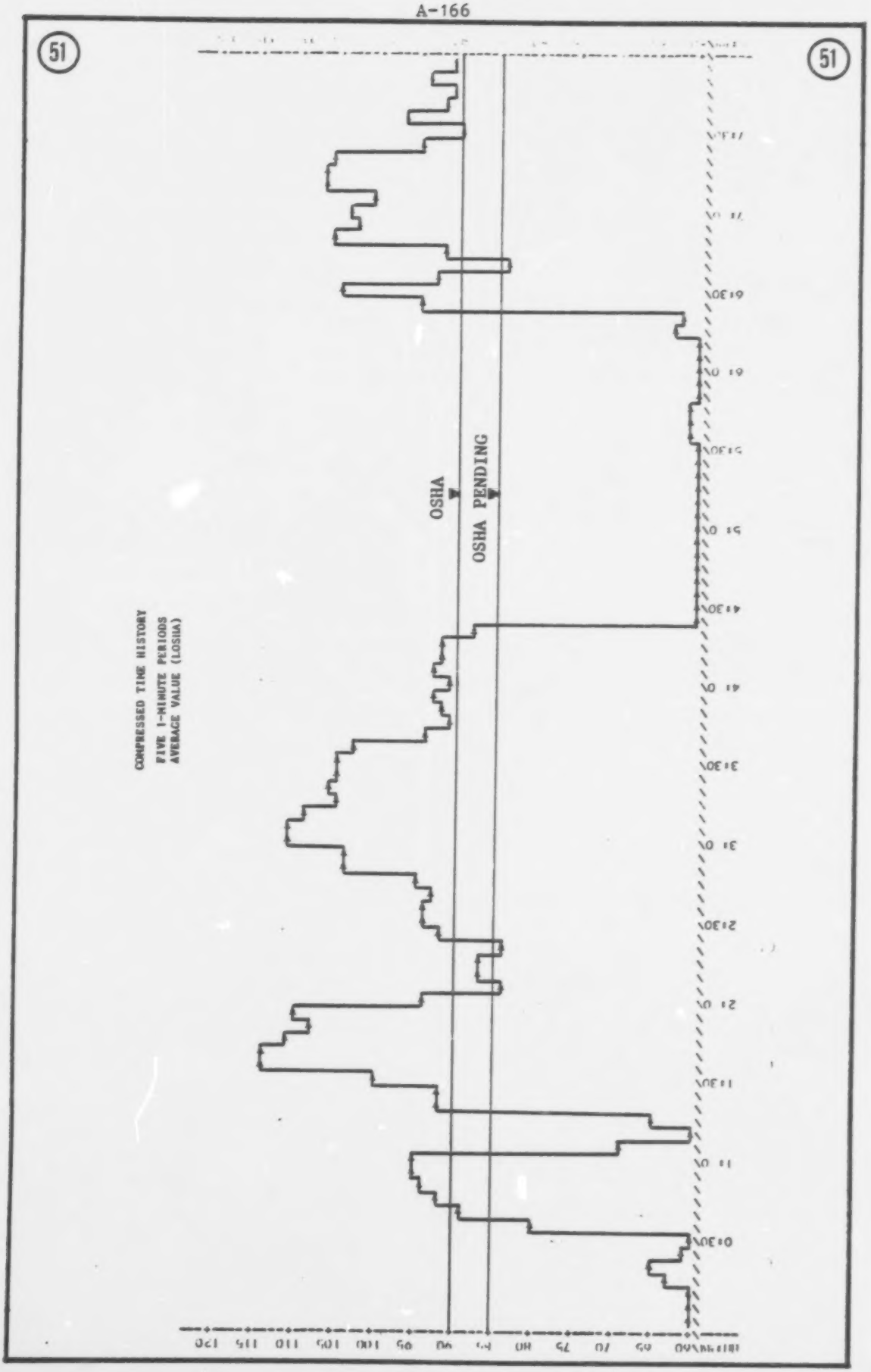
AMPLITUDE DISTRIBUTION

(51) (51)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
169	35.2	60 To 64
5	1.0	65 To 69
3	.6	70 To 74
3	.6	75 To 79
21	4.4	80 To 84
59	12.3	85 To 89
55	11.5	90 To 94
53	11.0	95 To 99
31	6.5	100 To 104
53	11.0	105 To 109
22	4.6	110 To 114
6	1.3	115 To 119

TOTAL NO. OF DATA POINTS = 480




51
51
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
60
65
70
75
80
85
90
95
100
105
110
115
120

(52)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225    60    64     4     1
     104     115200  480
  62  60  60  60  60  60  60  62  60  60  60  60  60  62  60  64
  62  64  66  64  60  62  63  65  65  62  64  65  60  68  60  65
  63  63  60  60  77  92  81  81  83  82  97 101  90  90  84  87
  84  94  95  96  93  89  91  91  96  99  84  62  60  60  60  60
  60  60  60  60  60  68  60  60  60  63  70  66  73  64  66  63
  65  63  65  62  64  60  60  66  70  70  66  84  84  81  74  68
  61  60  60  60  60  63  60  60  61  60  61  65  77  92  84  74
  61  60  60  66  60  62  60  62  60  64  62  60  60  60  60  60
  60  60  60  74  60  67  63  69  66  82 104 111 117 113 110 102
 114 103 104 108 116 115 117 113  75  80  75  78  97 116 105  97
 105 101 115 104 114 114 100 116 114 115 115 106  76  72 105  89
 111  98 108 119 118 112 110 106 118 115 115 116 118 117 104  81
  80  79  87 112 118 117 117 117 107  86  80 105  96 103 107 112
 110 107 117 116 116 121 118 121 117  81 120 120 113 119 114  83
  89 105 106 112 120 118 112 120 117 121 119 121 120 120 119 117
 120 117 121 120 111 112 120 118 117 112 120 118 113 115  80  83
  75  78  67  63  66  68  67  65  63  73  61  60  60  60  60  60
  61  61  73  69  82  77  92  98 111  93 118 119 118 118 108 112
 122 118 122 116 119 121 115  99  98  87 121 120 111  84  85 120
 115 117 115 117  95 116 120 117 119 121 116 120 119 114 121 120
 111 108 119 118 122 109 107 116 120 110 115 115 122 121 118 114
 122 118 113 115 112 113 115 116 115 119 117 110 117 114 120 119
 116 119 118 104  97 108 110 121 120 118 115 119 119 111 107  80
  81  80  79  79  74  74  79  65  69  60  60  60  60  60  63  60
  60  62  60  60  60  60  68  60  60  61  84  84  91  91  60  91
  91  92  94  93  92  84  60  63  78  88  87  62  76  91  91  68
  91  90  89  89  89  88  90  79  81  61  92  63  86  91  96  88
  90  91  94  96  91  92  88  72  61  60  60  60  60  61  60  68
  70  80  85  62  60  60  60  60  61  60  61  61  76  72  63  62
  60  60  65  64  60  60  60  60  60  69  60  60  60  60  60  86
%EOF
```

(52)

```
ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 98004

ENTER USER CODE (4 CHARS) : 4637

 ENTER JOB CODE (3 CHARS) : DGM
```

```
   DATA LOGGED :14  AUG 1979
        LOGGER : DB-301/26
SERIAL NUMBER : 1225
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8: 0: 0
```

```
DATA ANALYZED : 21 SEPT 1979
    SITE CODE : 98004
     JOB CODE : DGM
    USER CODE : 4637
    THRESHOLD :  60 DB
TOTAL SAMPLES =  115200
STANDBY TIME  =   0: 0:26
```

TIME HISTORY ANALYSIS

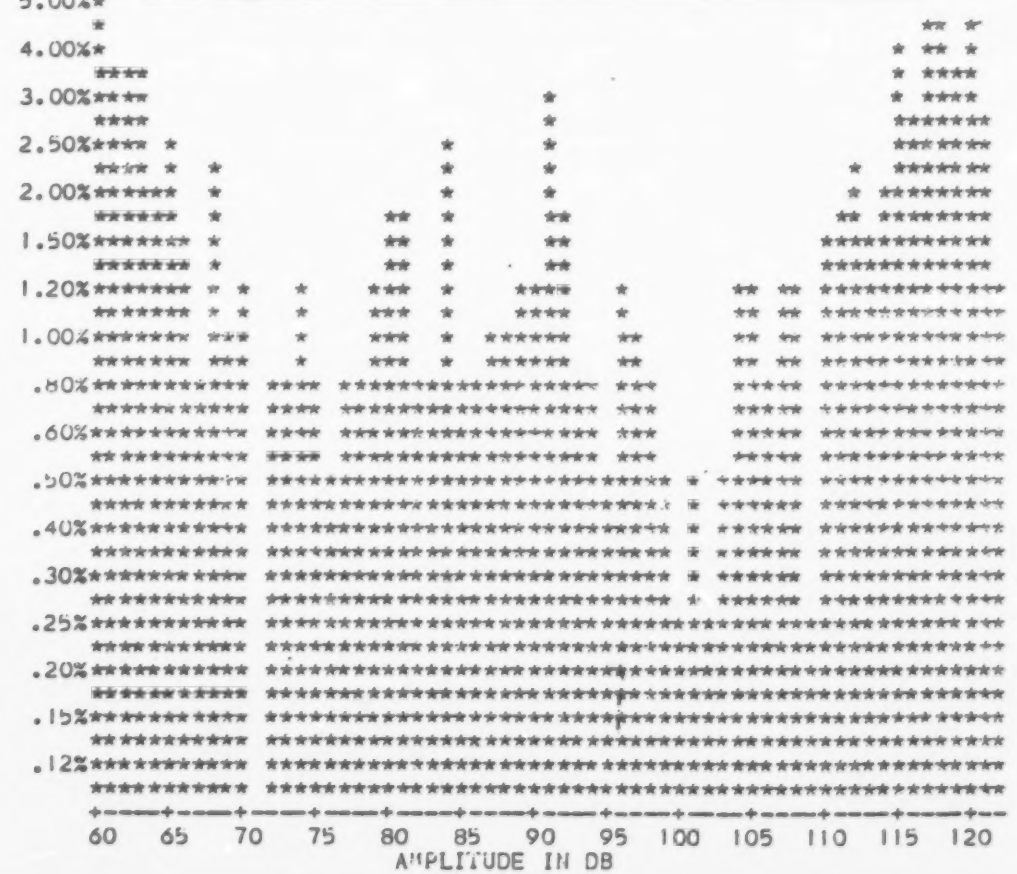
```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

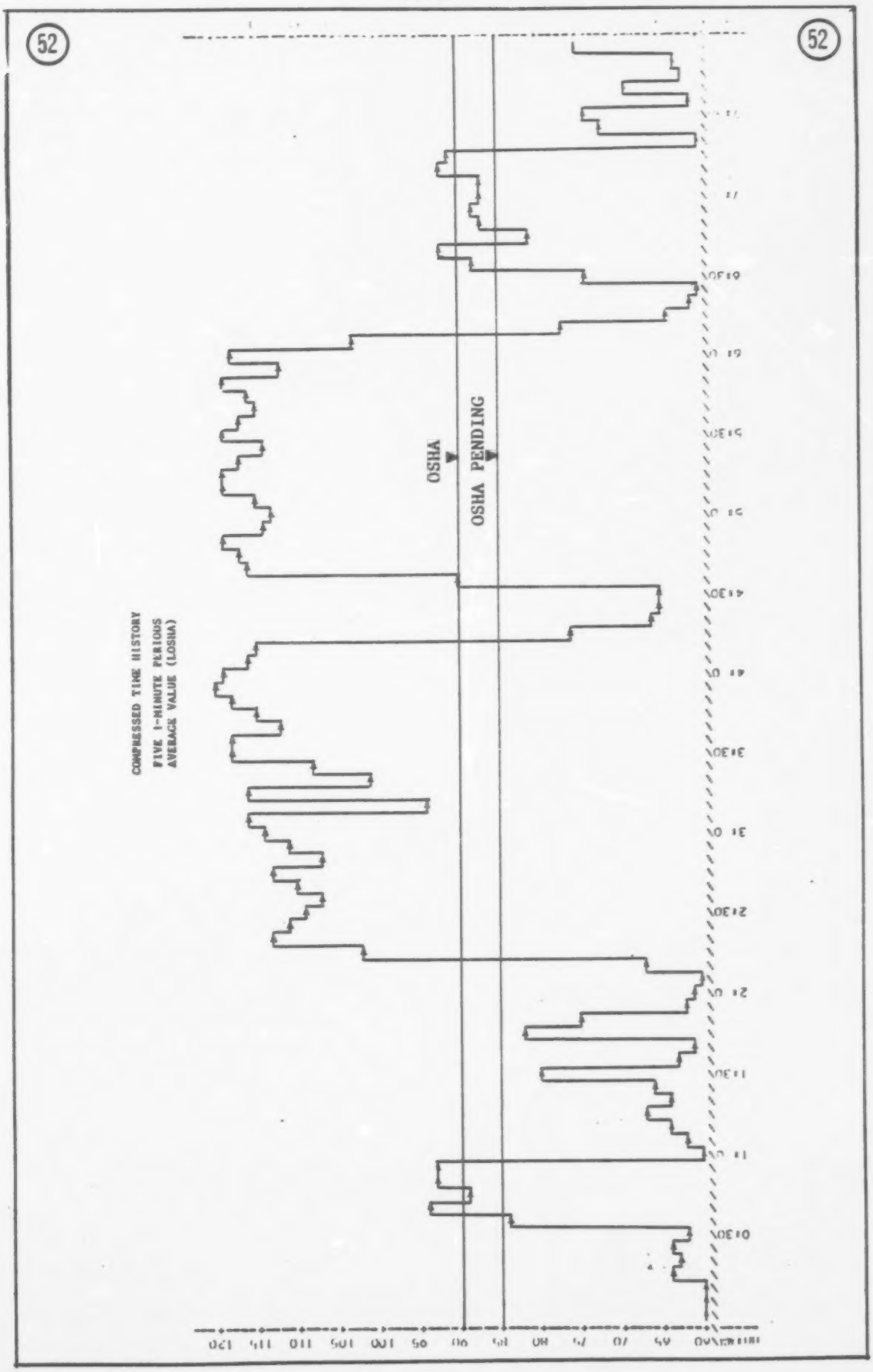
TIME	LEQ(A)		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.3	85.3	6.514	6.51
2	71.5	81.3	.962	7.48
3	107.7	100.2	145.803	153.28
4	115.0	107.3	400.649	553.93
5	113.0	108.9	301.809	855.74
6	116.6	110.9	497.832	1353.57
7	101.8	110.1	63.913	1417.48
8	82.4	109.1	4.343	1421.87

```
MIN. COMP. =  60 DB                MAX. COMP. = 122 DB
ARITHMETIC MEAN =  87 DB
STD. DEVIATION =  23 DB
VARIANCE =529 DB
```

(52) AMPLITUDE DISTRIBUTION (52)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
145	32.5	60 TO 64
32	7.2	65 TO 69
16	3.6	70 TO 74
16	3.6	75 TO 79
30	6.7	80 TO 84
19	4.3	85 TO 89
30	6.7	90 TO 94
16	3.6	95 TO 99
11	2.5	100 TO 104
19	4.3	105 TO 109
36	8.1	110 TO 114
76	17.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




52
52
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(53)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(53)

```
  1  26  80  1226    60    64     4     1
  58713      80716  336
 64  63  60  60  60  60  62  60  60  60  60  60  60  64  66  66
 68  69  73  63  60  60  60  70  62  69  67  65  76  79  60  69
 89  80  60  84  90  83  85  83  74  89  89  83  89  86  85  86
 93  93  94  94  76  93  88  95  80  60  60  60  66  77  60  60
 64  68  60  60  60  60  60  62  60  60  60  60  60  60  60  60
 78  86  89 100  86  86  76  77  72  73  78  65  65  67  77  72
 71  72  78  77  72  65  63  74  78  74  66  70  79  74  65  69
 77  74  76  60  66  61  81  60  76  81  65  68  66  60  60  60
 60  61  67  74  64  62  67  60  76  68  70  64  66  68  64  74
 70  60  60  60  60  60  60  60  60  60  60  60  61  79  81  72
 60  62  76  63  60  66  65  60  68  61  69  67  68  65  73  81
 81  77  81  79  75  69  76  77  72  65  71  78  65  66  60  67
 69  69  61  68  67  65  60  60  60  62  64  60  65  65  68  66
 69  60  61  64  78  72  63  67  63  63  66  61  65  67  60  60
 65  68  70  65  60  77  78  78  71  71  60  73  69  60  66  60
 60  60  60  60  60  60  66  62  69  69  71  63  61  66  68  66
 60  76  86  96  75  65  63  60  71  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  62  74  86  87  87  88  87  87  97  90  87  88
 88  87  88  87  89  88  87  86  88  85  78  70  64  74  66  61
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 98034
ENTER USER CODE (4 CHARS) : 4410
 ENTER JOB CODE (3 CHARS) : DGM
```

```
   DATA LOGGED :14  AUG 1979          DATA ANALYZED : 21 SEPT 1979
        LOGGER : DB-301/2G                SITE CODE : 98034
SERIAL NUMBER : 1226                       JOB CODE : DGM
      BASELINE : 60 DB                     USER CODE : 4410
 DYNAMIC RANGE : 94 DB                     THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC            TOTAL SAMPLES =   80710
 TEST DURATION =   5:36:19          STANDBY TIME =    4: 4:36
```

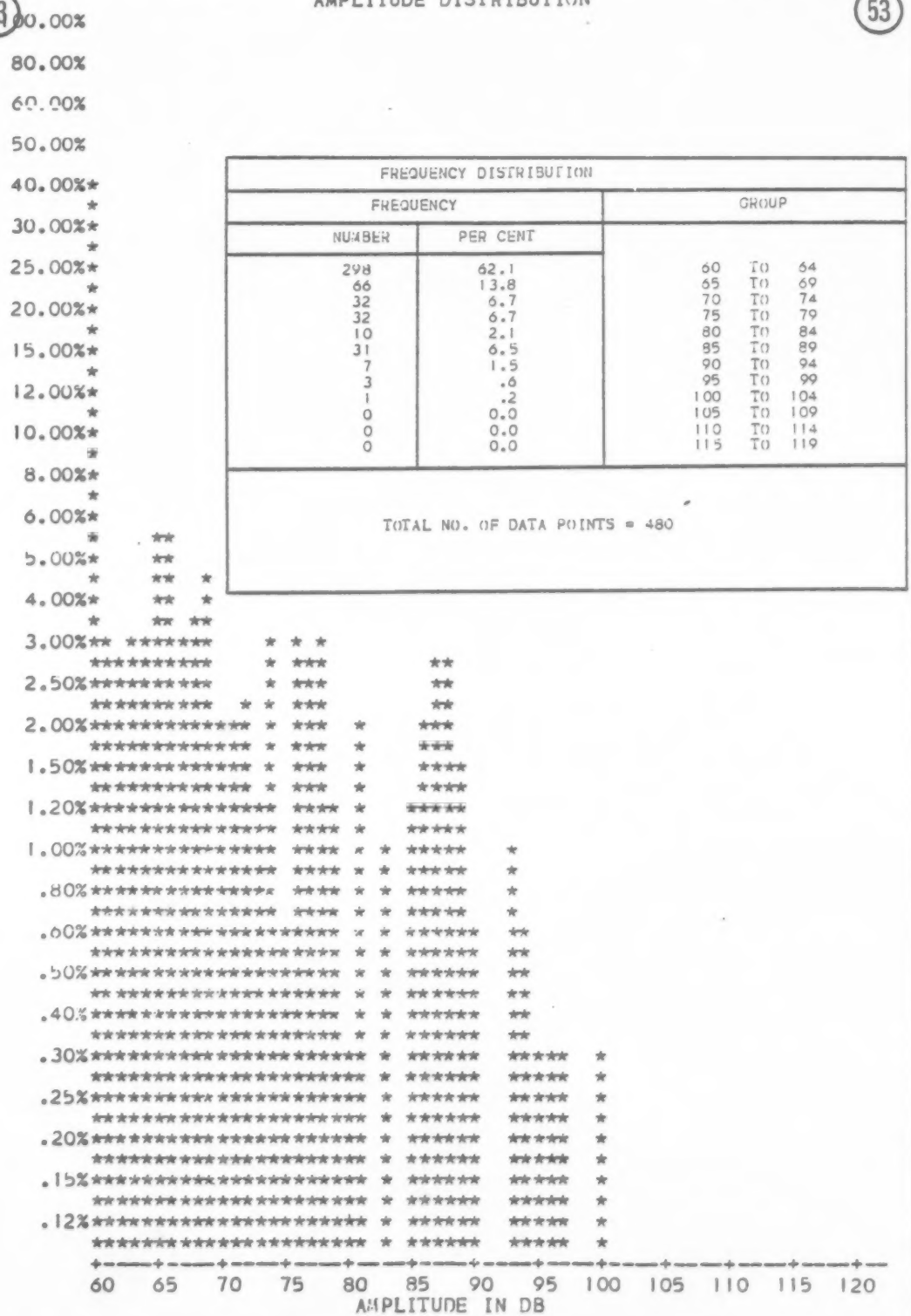
TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 336
PERIOD =  1 MINUTES
```

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	81.9	81.9	4.079	4.08
2	77.5	80.0	2.212	6.29
3	70.6	78.0	.854	7.15
4	69.0	76.6	.678	7.82
5	71.0	75.8	.904	8.73
6	84.5	77.4	3.513	12.24

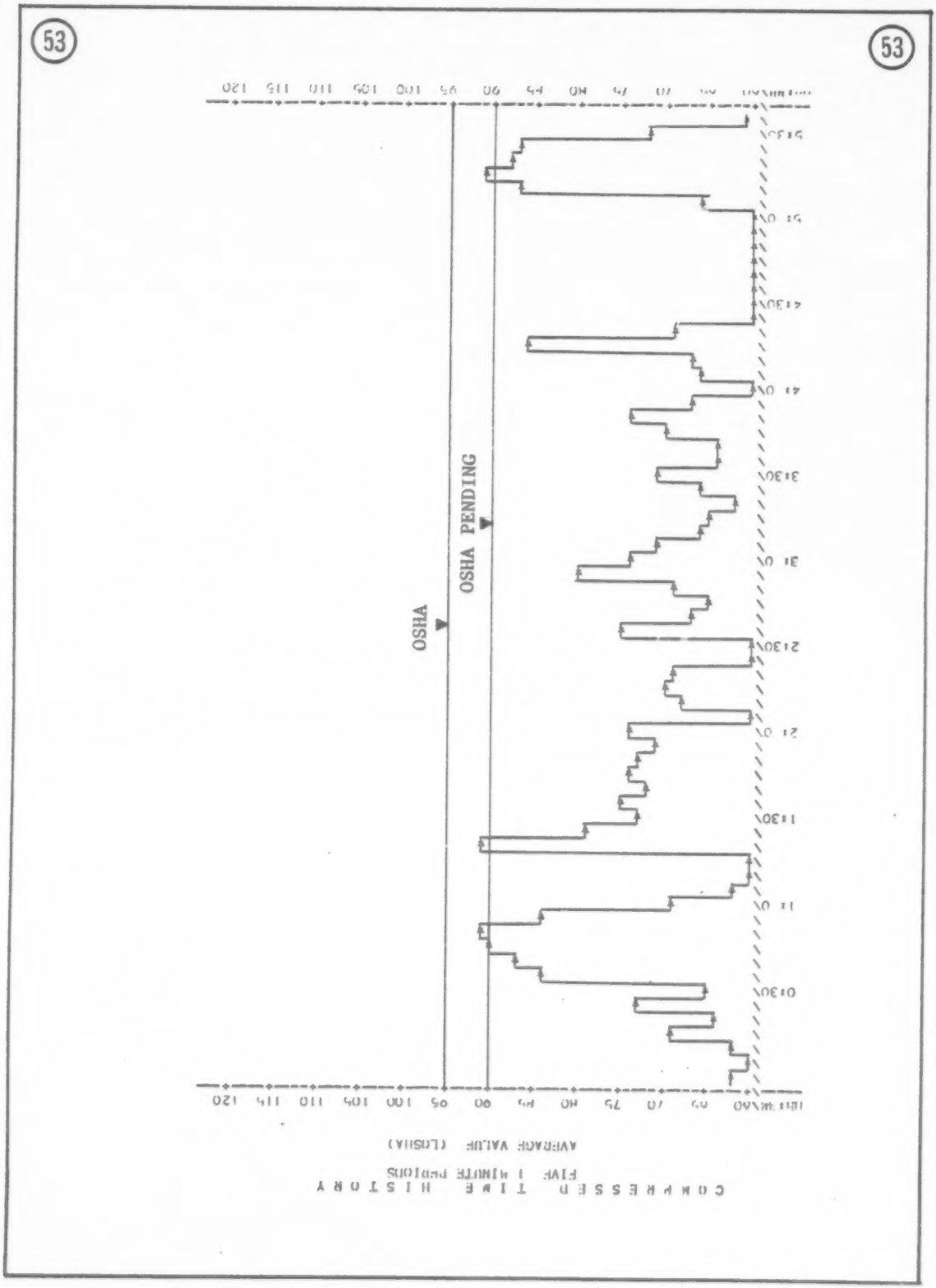
```
MIN. COMP. =  60 DB          MAX. COMP. = 100 DB
ARITHMETIC MEAN =  66 DB
STD. DEVIATION =  10 DB
VARIANCE =100 DB
```

(53) AMPLITUDE DISTRIBUTION (53)



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
298	62.1	60 To 64
66	13.8	65 To 69
32	6.7	70 To 74
32	6.7	75 To 79
10	2.1	80 To 84
31	6.5	85 To 89
7	1.5	90 To 94
3	.6	95 To 99
1	.2	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480


53
53
COMPRESSED TIME HISTORY
FIVE 1 MINUTE PERIODS
AVERAGE VALUE (LPSIA)
OSHA
OSHA PENDING

(54)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

```
  1  26  80  1219    60    64     4     1
     106     115200   480
 66  60  61  62  60  60  60  73  70  74  60  60  60  60  65  61
 66  60  62  62  60  68  60  60  60  60  60  61  62  87  98  94
 83  81  81  88  87  93  95 100  94  85  85  92  96  95  92  96
 93  94  86  69  93  88  93  97  90  73  60  60  60  60  60  60
 60  60  60  60  60  60  65  60  66  64  75  73  60  60  60  61
 63  68  68  70  77  80  68  77  75  78  79  79 115 119 116 115
120 115  73  95 113 119 117 100 114  77  92 119  90 111 110  76
 80  78  84  82  77  74  93 119 119 113 119 119 112 102 116 115
119 114 110 119 116 109 103 117 120 116 108 112 107 106 117 117
118 111 111 120 119 116 119 118 118 117 103 117 118 119  90  97
118 120 117 105 118 115 101  69  76  67  79  76 107 110 115 119
122 115 120 121 110 120 121 109 116 118 118  83  64  62  60  60
 60  68  61  68  60  94 117 116 120 113 119 117 118  71  66  66
 68  72  72  68  64  63  60  71  62  69  68  70  67  63  69  99
100 104 112 108 106 118 116 103 115 116 115 112 117 118 116 114
101 110 114 114 114 113 119 114 114 120 116 115  80  99  73 110
112  61  60  60  63  60  60  60  60  60  60  60  60  60  62  61  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  70
 65  84 115 116 112 114 100 114 119 114 104  73 111 116 118 112
116 118 113 117 116 118 115 118 118  91  71  62  75  80  86  71
 61  60  64  72  77  64  68 107 107 108 108 107 108 108 102  90
 60  62  60  64  60  60  63  60  60  60  60  62  60  60  60  60
 64  61  68  81  71  68  89  88  66  82  72  60  61  79  91  88
 87  87  87  85  83  80  75  61  68  60  60  60  60  77  65  60
 60  73  60  73  69  74  88  89  84  60  60  61  60  88  91  91
 90  90  90  91  92  92  87  92  88  91  91  90  91  89  92  91
 88  92  86  90  91  92  90  89  89  62  60  60  60  60  60  60
 60  60  60  60  60  64  61  60  60  63  65  65  60  60  62  60
 60  60  60  60  60  60  63  60  63  66  60  70  60  73  60  60
 67  62  60  60  74  88  92  89  89  97  90  92  92  83  75  64
%EOF
```

(54)

```
ENTER LOG DATE (DD/MM/YR) : 13/08/79
ENTER SITE CODE (5 CHARS) : 98044
ENTER USER CODE (4 CHARS) : 4637
 ENTER JOB CODE (3 CHARS) : DGM
```

```
   DATA LOGGED :13  AUG 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 98044
SERIAL NUMBER : 1219                       JOB CODE : DGM
     BASELINE : 60 DB                     USER CODE : 4637
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:26
```

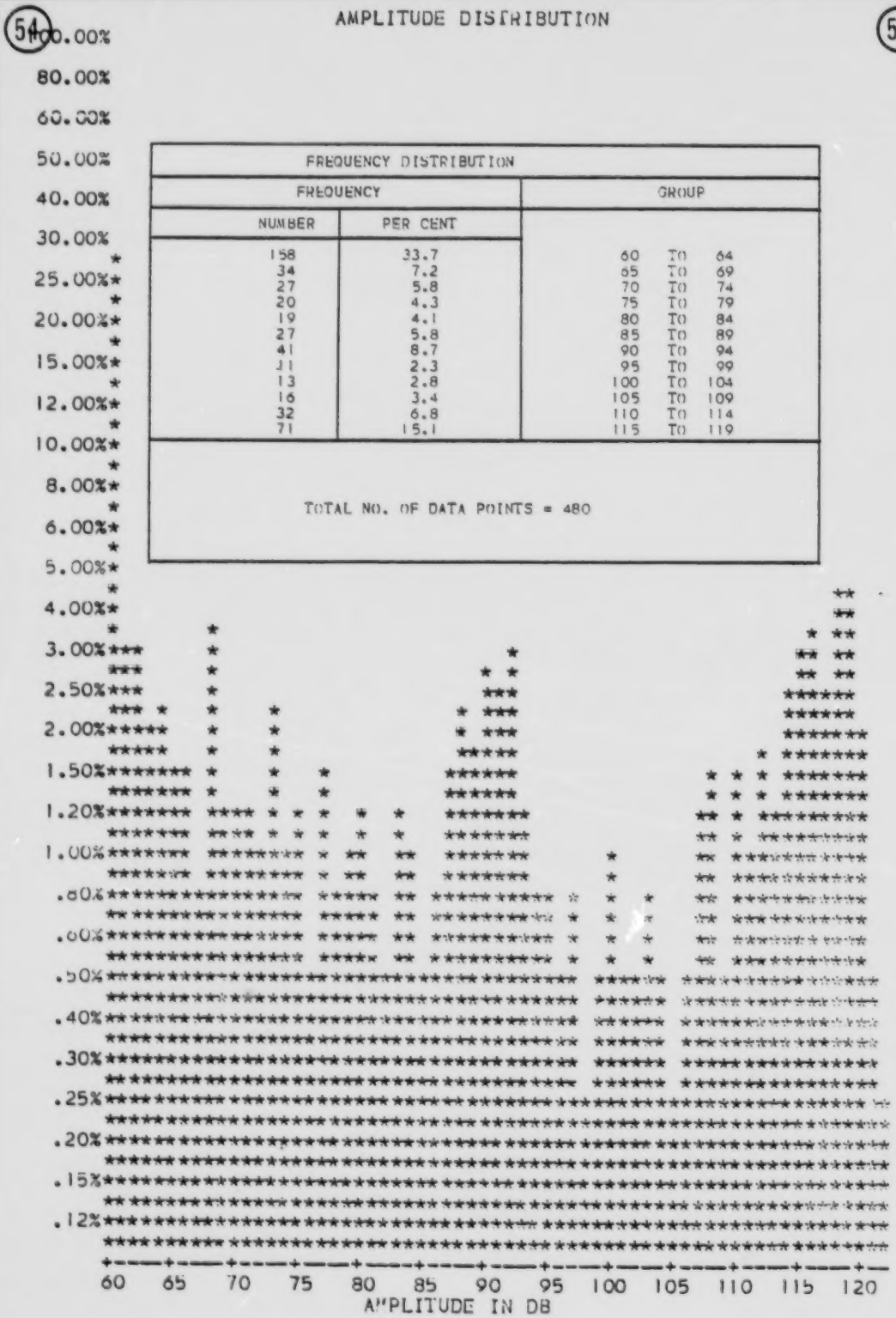
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

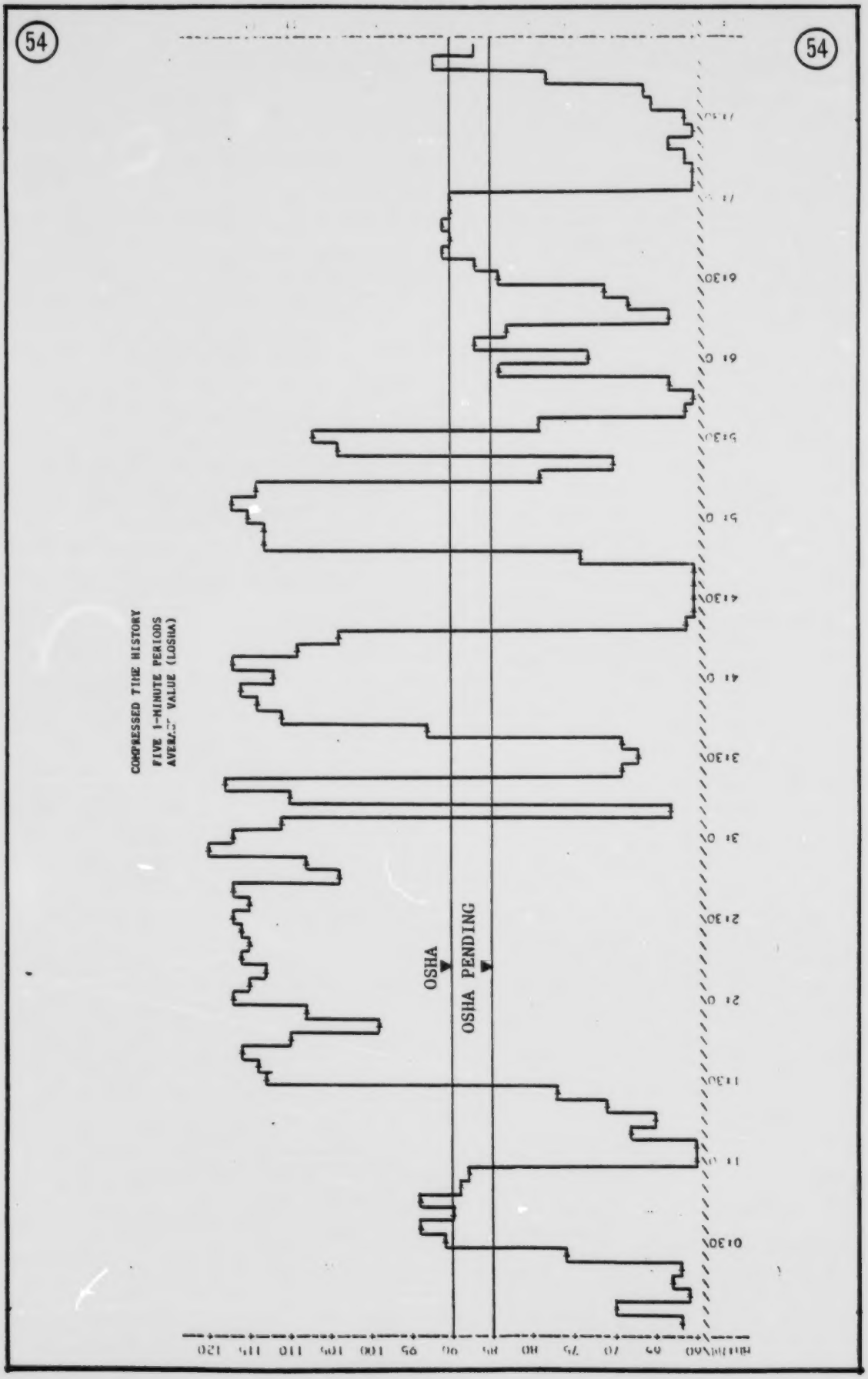
TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.7	86.7	7.936	7.94
2	106.4	101.9	121.427	129.36
3	115.3	109.3	417.078	546.44
4	110.7	109.7	219.842	766.28
5	107.2	109.3	136.413	902.70
6	106.4	108.9	121.304	1024.00
7	85.6	107.3	6.814	1030.81
8	80.8	106.9	3.519	1034.33

MIN. COMP. = 60 DB MAX. COMP. = 122 DB
ARITHMETIC MEAN = 84 DB
STD. DEVIATION = 22 DB
VARIANCE =464 DB

54 AMPLITUDE DISTRIBUTION 54



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
158	33.7	60 TO 64
34	7.2	65 TO 69
27	5.8	70 TO 74
20	4.3	75 TO 79
19	4.1	80 TO 84
27	5.8	85 TO 89
41	8.7	90 TO 94
11	2.3	95 TO 99
13	2.8	100 TO 104
16	3.4	105 TO 109
32	6.8	110 TO 114
71	15.1	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


54
54
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30\
11 0\
11:30\
12 0\
12:30\
13 0\
13:30\
14 0\
14:30\
15 0\
15:30\
16 0\
16:30\
17 0\
17:30\
18 0\
18:30\
19 0\
19:30\
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20:30\
21 0\
21:30\
22 0\
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38 0\
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39 0\
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41 0\
41:30\
42 0\
42:30\
43 0\
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46 0\
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110:30\
111 0\
111:30\
112 0\
112:30\
113 0\
113:30\
114 0\
114:30\
115 0\
115:30\
116 0\
116:30\
117 0\
117:30\
118 0\
118:30\
119 0\
119:30\
120 0\
120:30

(55)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1216   60   64    4    1
   2720    115200  480
 72  70  62  62  68  61  60  61  63  61  62  60  60  60  61  60
 60  65  62  60  61  62  69  97  95  89  81  82  87  86  94  98
 91  84  84  91  97  97  93  98  96  95  91  64  75  64  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  73  70  61  64  61  64  65  60  63  62  73  67
 60  60  62  60  60  60  73  60  60  72  68 102  91  72  62  64
 60  60  60  60  61  67  66  65  76  95  97  71 110 105 112 109
113 110 106  63  74  85  84  80 109  85  84  93  97 113 100 106
107 113 111 112 113 113 112 110 109 109 114 101 100  95  88  83
 81  80  82  79  76  71  72  74  60  69  67  60  61  60  62  69
 65  60  64  61  60  74  68  86  72  82  76  76  72  69  79  79
 84  78  60  60  60 104 106  81  84  98  99 108 106 101  68  67
 73  75  72  77  60  60  85 103 100 113 112 112 106  96 113 109
110 109  77 108 113 109 110  96 115 120 117 116 117 116 117 119
118 119 117 120 120 112  89  88  89 114 119 110 121 120 117 120
121 104 113 118 119 117 110 106 115 117 120 116 100  95 108 118
117 118 119 120 120 119 114 121 116 118 118 116 118 119 117 118
117 117 119 115 100  85  92  61  60  73  71  60  60  72  60  71
 78  61  60  60  86  90  89  89  95  89  88  88  89  66  74  60
 63  77 109 111  94  96  97  89  67  68  60  69  60  66  60  60
 86  75  64  69  75  79  70  60  60  60  68  60  64  70  69  60
 60  60  60  60  60  60  68  75  66  60  68  60  61  65  63  60
 61  60  62  63  61  60  60  60  69  69  64  63  60  60  60  60
 77  72  73  93  94  83  92  92  91  89  91  88  90  94  86  85
 91  61  91  60  79  95  93  90  90  92  94  92  95  93  97  96
 91 104  63  93  77  61  60  60  65  83  83  62  63  73  65  64
 62  60  61  60  65  64  64  72  74  72  64  67  74  83  82  83
 79  72  71  68  78  80  70  74  79  80  80  89  99  97  98  99
 98  80  75  74  75  71  74  74  74  72  70  69  63  60  62  63
 60  63  67  60  60  60  60  60  60  62  67  60  60  60  60  61
*EOF


ENTER LOG DATE (DD/MM/YR) : 13/08/79
ENTER SITE CODE (5 CHARS) : 29003
ENTER USER CODE (4 CHARS) : 4636
 ENTER JOB CODE (3 CHARS) : DGM


   DATA LOGGED :13  AUG 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 29003
SERIAL NUMBER : 1216                       JOB CODE : DGM
     BASELINE : 60 DB                      USER CODE : 4636
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0            STANDBY TIME =   0:11:20

            TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOOK PLACE = 40 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

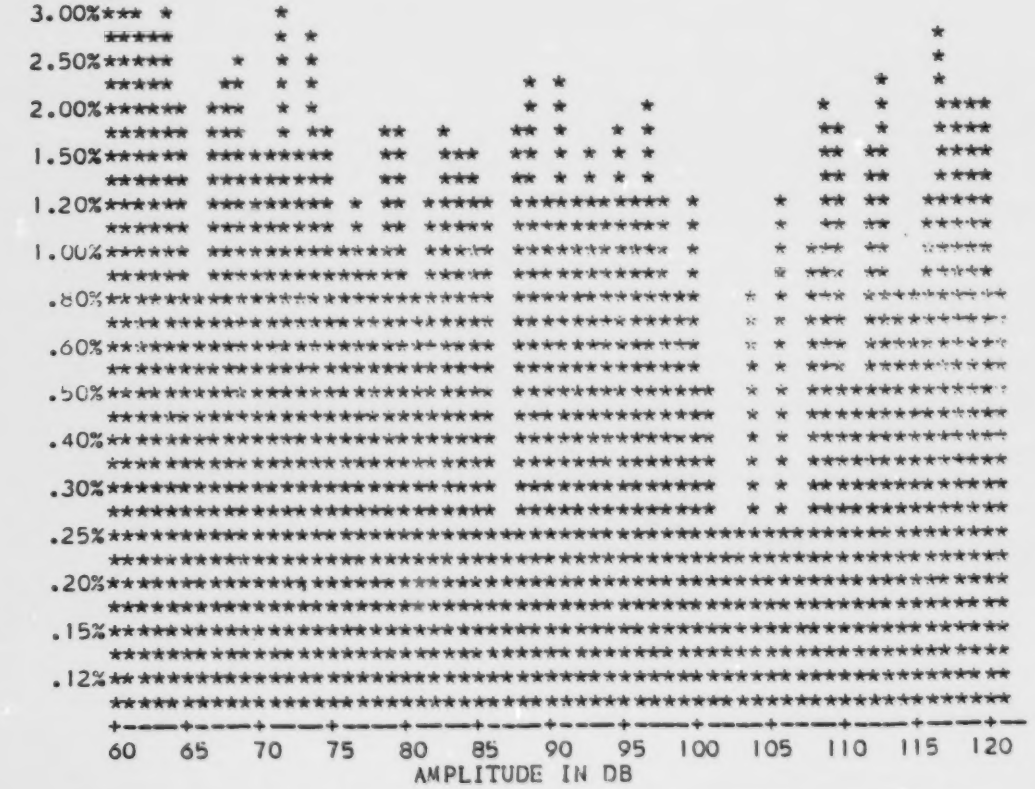
TIME          LOGA                    NOISE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1      85.3       85.3        6.501       6.50
   2      95.2       91.9       25.852      32.35
   3     101.3       96.5       60.060      92.42
   4     112.0      104.2      265.047     357.46
   5     113.2      107.1      312.563     670.03
   6      87.7      105.9        9.038     679.07
   7      88.1      104.9        9.667     688.73
   8      82.6      104.0        4.482     693.22
MIN. COMP. =  60 DB              MAX. COMP. = 121 DB
ARITHMETIC MEAN =  81 DB
STD. DEVIATION =  20 DB
VARIANCE =400 DB
```

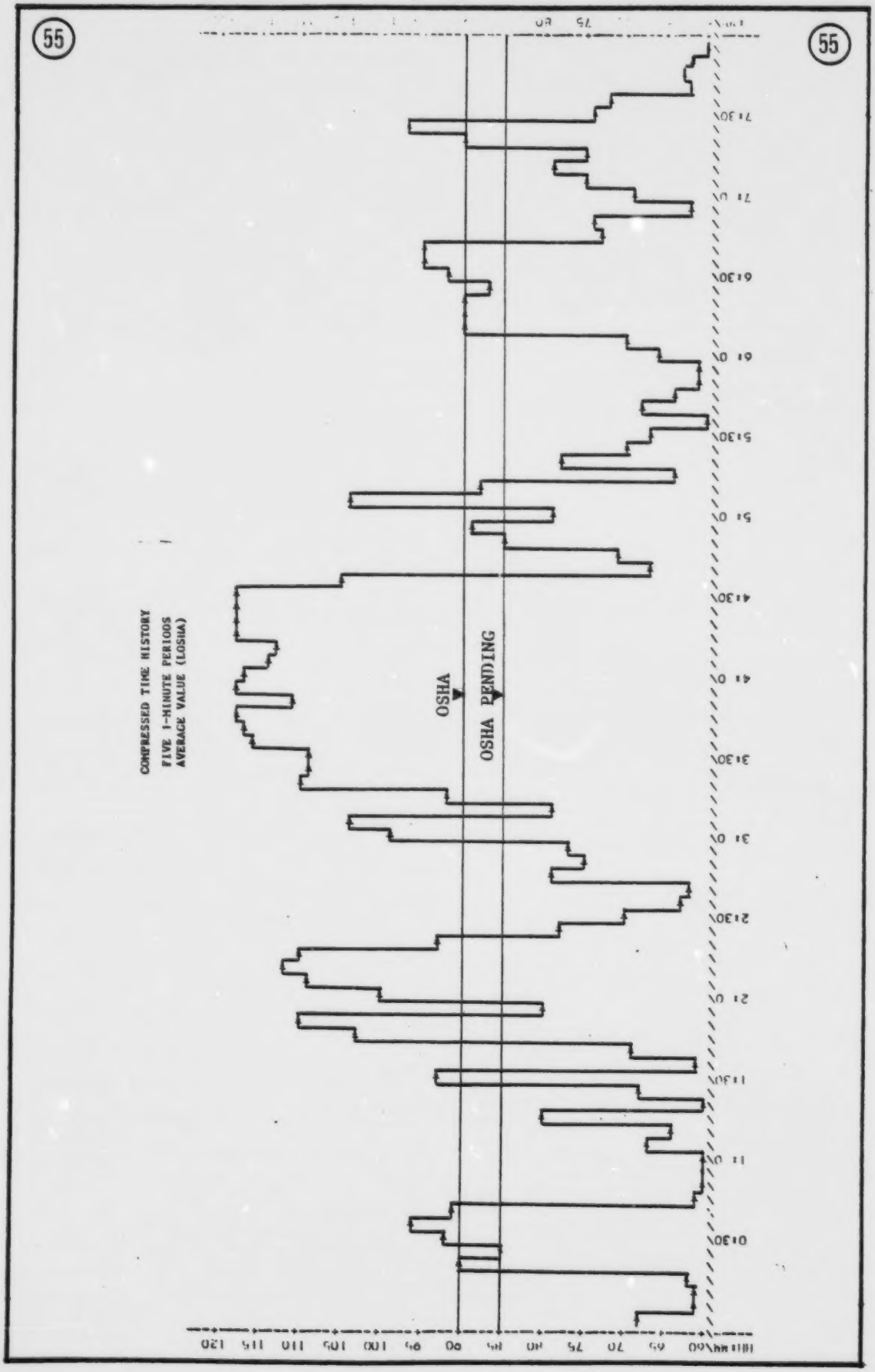
(55)

AMPLITUDE DISTRIBUTION

(55) (55)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
155	33.0	60 TO 64
38	8.1	65 TO 69
42	9.0	70 TO 74
27	5.8	75 TO 79
28	6.0	80 TO 84
28	6.0	85 TO 89
30	6.4	90 TO 94
28	6.0	95 TO 99
12	2.6	100 TO 104
19	4.1	105 TO 109
27	5.8	110 TO 114
35	7.5	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




55
55
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1: 0
1:30
2: 0
2:30
3: 0
3:30
4: 0
4:30
5: 0
5:30
6: 0
6:30
7: 0
7:30
60
65
70
75
80
85
90
95
100
105
110
115
120

(56)

```
PLACE TAPE IN HEADER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226   60   64    4    1
      22      115200  480
 60  61  64  60  60  60  60  63  67  69  64  60  60  60  62  63
 60  76  61  65  66  60  60  60  60  60  60  60  60  62  65
 66  61  60  60  70  71  74  71  68  73  89  91  90  90  93  92
 92  93  98  99  98  98  98  99 101  99  98  94  96  93  90  95
 94  92  91  92  91  94  91  90  92  98  92  78  86  83  80  80
 60  62  64  60  61  64  64  60  60  60  60  60  60  60  60  60
 60  60  61  60  60  60  65  72  63  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 62  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  62  80  83  83  82  86  68  60  60  60  60  65  86  75  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  82  60  83  60  60  60  74  74  77  70
 62  61  68  69  65  66  60  71  73  82  80  64  82  83  82  81
 81  84  92  83  90  99  86  84  81  80  81  81  78  70  77
 79  62  78  79  78  67  60  74  77  77  68  65  73  79  75  76
 66  62  67  67  60  69  61  86  91  68  60  60  60  70  68  60
 62  61  61  62  60  67  60  64  63  68  61  60  60  60  69  65
 60  60  60  60  71  78  85  84  76  63  60  60  62  60  60  60
 65  61  61  69  68  62  60  60  60  60  60  62  60  64  60  62
 63  68  67  66  60  60  66  60  60  60  60  60  65  65  63  65  60
 69  60  61  67  60  68  68  64  94  95  96  90  82  63  60  61
 72  76  63  60  60  60  60  62  60  60  60  60  60  60  78  81
 78  72  60  76  80  89  86  88  61  66  84  78  63  60  70  83
 84  76  80  82  60  60  61  61  90  62  60  80  70  78  82  82
 88  84  83  87  92  94  94  92  81  82  64  60  60  62  60  60
 63  60  71  65  63  65  62  84  80  88  60  65  61  63  70  70
 71  74  68  60  63  63  62  69  65  73  62  60  60  60  63  68
 73  69  66  71  69  71  66  67  61  71  72  63  60  77  70  72
 75  87  95  92  83  89  91  89  87  81  75  64  70  64  65  69
 76  68  73  77  71  85  92  91  91  93  91  87  87  95  96  93
$EOF


ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : 20960
ENTER USER CODE (4 CHARS) : 2525
 ENTER JOB CODE (3 CHARS) : 270


   DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 20960
 SERIAL NUMBER : 1226                       JOB CODE : 270
      BASELINE : 60 DB                     USER CODE : 2525
 DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
 SAMPLING RATE :  4/SEC              TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0            STANDBY TIME =   0: 0: 5

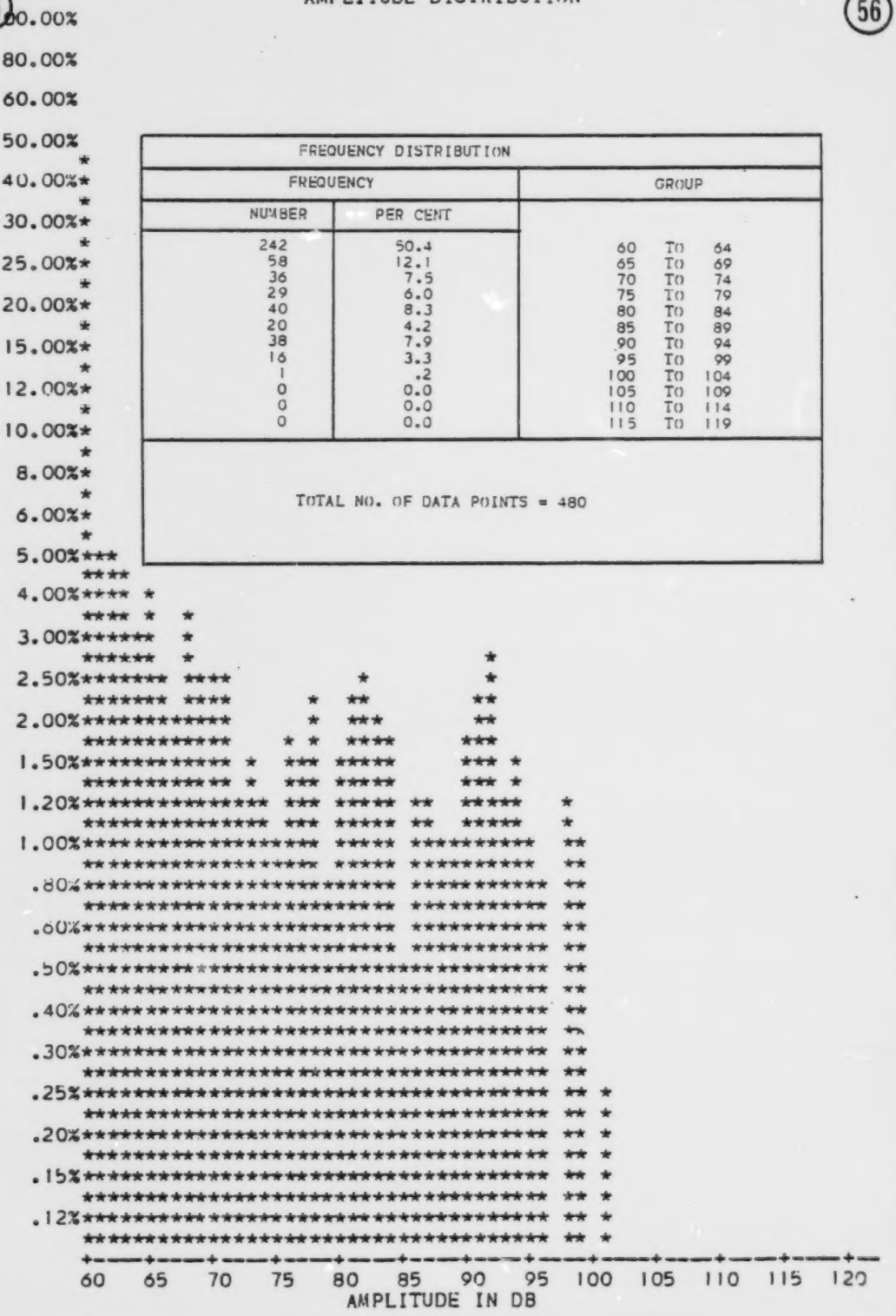
            TIME HISTORY ANALYSIS

 NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
 ARE BASED ON THE FOLLOWING:
 100% DOSE = 90 DB / 8 HRS
 EXCHANGE (DOUBLING) RATE = 5 DB
 THRESHOLD (CUTOFF) LEVEL = 80 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD =  1 MINUTES

 TIME          LOSHA                    %DOSE
 HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
    1       87.6       87.6        8.952       8.95
    2       82.7       85.6        4.545      13.50
    3       69.5       83.0         .729      14.23
    4       80.1       82.4        3.185      17.41
    5       71.1       81.1         .913      18.32
    6       78.4       80.8        2.494      20.82
    7       80.3       80.7        3.239      24.06
    8       83.5       81.1        5.094      29.15
 MIN. COMP. =  60 DB              MAX. COMP. = 101 DB
 ARITHMETIC MEAN =  69 DB
 STD. DEVIATION =  12 DB
 VARIANCE =144 DB
```

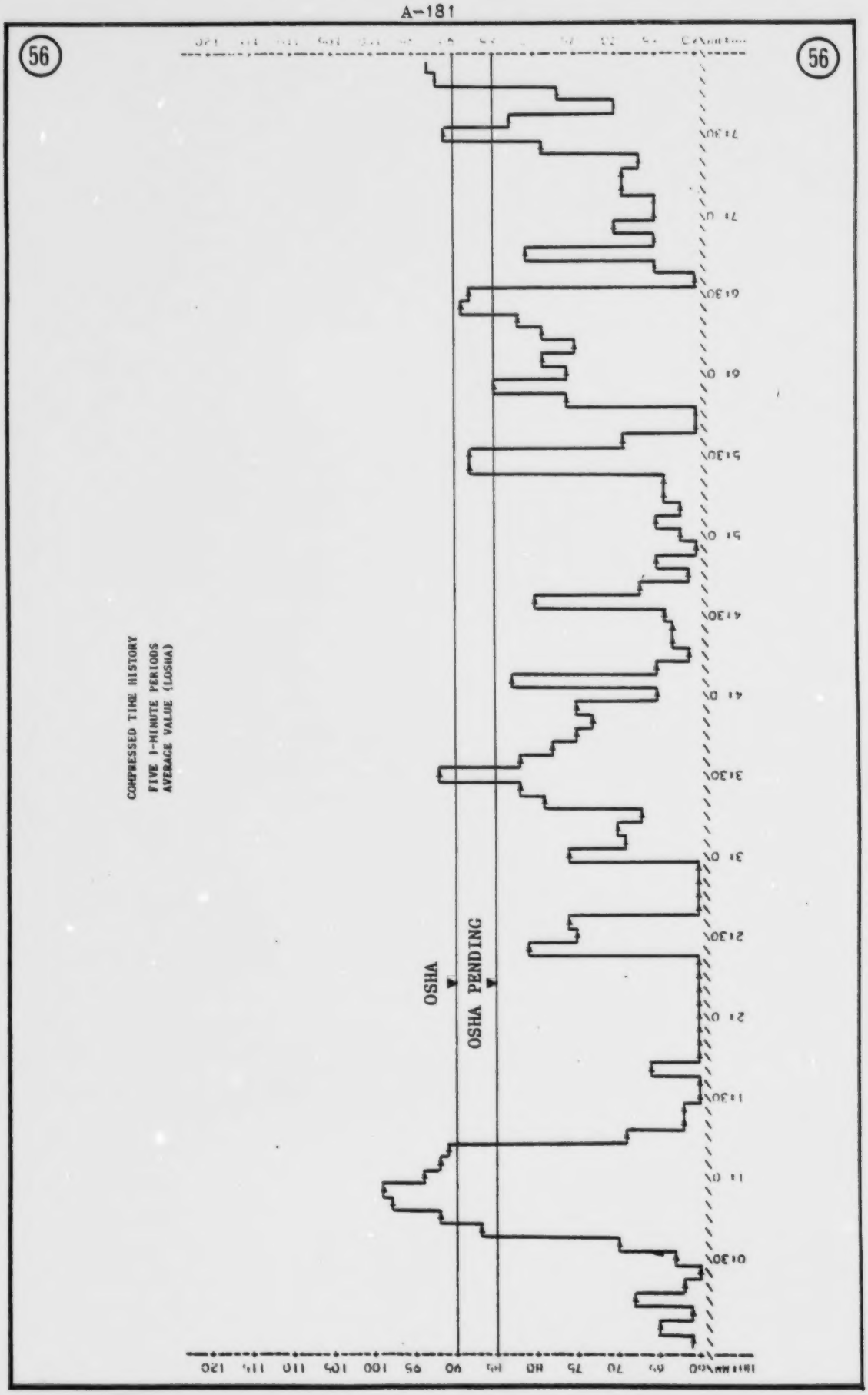
(56)

56 AMPLITUDE DISTRIBUTION 56



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
242	50.4	60 TO 64
58	12.1	65 TO 69
36	7.5	70 TO 74
29	6.0	75 TO 79
40	8.3	80 TO 84
20	4.2	85 TO 89
38	7.9	90 TO 94
16	3.3	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


56
56
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
7:30
7: 0
6:30
6: 0
5:30
5: 0
4:30
4: 0
3:30
3: 0
2:30
2: 0
1:30
1: 0
0:30
120
115
110
105
100
95
90
85
80
75
70
65

(57)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226    60    64     4     1
     71      115200   480
  65  60  68  63  60  60  71  66  60  60  61  67  70  65  82  82
  82  90  83  81  80  71  82  79  79  88  84  93  92  93  93  94
  92  97  82  78  69  60  60  60  64  60  60  60  60  60  61  60
  60  70  60  60  60  60  60  60  60  60  60  60  60  60  63  61
  71  62  64  65  67  71  72  67  72  61  63  71  62  80  82  81
  94  94  83  60  60  62  83  60  60  60  60  60  63  60  60  60
  60  61  70  64  60  89 104 107 102 102 105  96 102  61  92 107
 105  99  98  87  94  81  60  60  77  79  60  60  60  64  61  61
  61  60  60  60  70  83  82  82 106 107 109  96 105  65  82  60
 102  60  69  63  67  60  63  61  63  60  62  61  60  62  62  71
  60  63  73  60  68 105 103 105 104  60 100 102  82  61  63  63
  61  91  83 101 103 102 102 106 101 102  85  60  60  60  68  62
  60  60  60  60  63  76 105  77 108 105 105  62 102 106 105  98
  83  91  70  76  62  60 102 107 106 106 107 104 107  92  60  60
  62  60 103 107 106 106 103 108  98  91 101  64  61  60  60 103
 108 107 105 109  88  60  60  61  68  66  66  60  62  73 100  88
  60  60  60  60  60  60  60  63  67  73  70  66  63  71  70  66
  62  66  61  64  68  67  61  65  67  64  63  60  65  67  71  71
  65  66  63  69  71  70  70  72  70  60  60  60  60  62  63  95
 105 111 110 108 108 106 111  86  93  76  95  94 112 110 111 111
 111 109 111  99  80  60  62  68  70  60  61  67  70  68  76  61
  75  80  97  92  76  73  69  75  65  72  64  71  74  61  70  72
  67  63  69  61  75  70 111 112 102 108 110 105  75  85  81  98
 107 110  78 112 103 100 111  63  89  86  60  60  62  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  68  61  60  60  60  60
  60  60  60  60  60  65  62  64  63  75  70  73  67  60  60  60
  60  60  60  61  60  60  60  60  63  60  60  60  60  62  60  65
  60  63  72  63  64  61  60  60  60  60  60  60  81  60  60  60
  61  60  67  74  62  63  62  60  82  63  60  62  63  62  82  94
%EOF


ENTER LOG DATE (DD/MM/YR) : 30/07/79
ENTER SITE CODE (5 CHARS) : 29003

ENTER USER CODE (4 CHARS) : 4770

 ENTER JOB CODE (3 CHARS) : 272


   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 29003
 SERIAL NUMBER : 1226                       JOB CODE : 272
      BASELINE : 60 Db                     USER CODE : 4770
 DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
 SAMPLING RATE :  4/SEC             TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0           STANDBY TIME =   0: 0:17

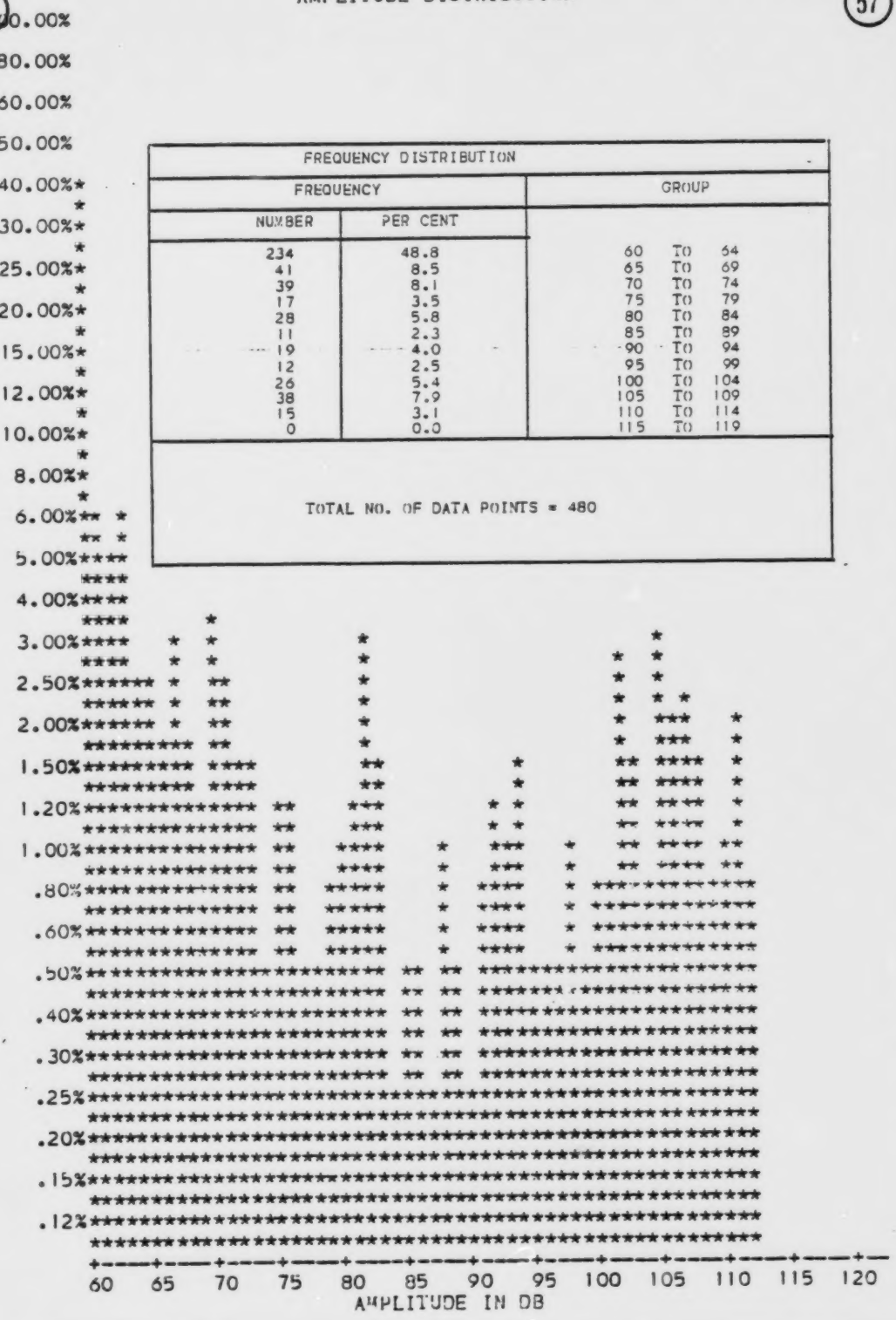
          TIME HISTORY ANALYSIS

 NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
 ARE BASED ON THE FOLLOWING:
 100% DOSE = 90 Db / 8 HRS
 EXCHANGE (DOUBLING) RATE = 5 DB
 THRESHOLD (CUTOFF) LEVEL = 80 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD =  1 MINUTES

 TIME          LOSHA                        %DOSE
 HOUR     CURRENT  CUMULATIVE        CURRENT  CUMULATIVE
    1       81.3       81.3          3.742       3.74
    2       92.1       88.5         16.619      20.36
    3       93.5       90.6         20.302      40.66
    4       99.8       94.2         48.309      88.97
    5       89.0       93.4         10.851      99.82
    6      101.0       95.3         57.514     157.34
    7       95.2       95.3         25.794     183.13
    8       70.7       94.4           .866     184.00
 MIN. COMP. =  60 DB                MAX. COMP. = 112 DB
 ARITHMETIC MEAN =  74 DB
 STD. DEVIATION =  17 DB
 VARIANCE =289 DB
```

(57)

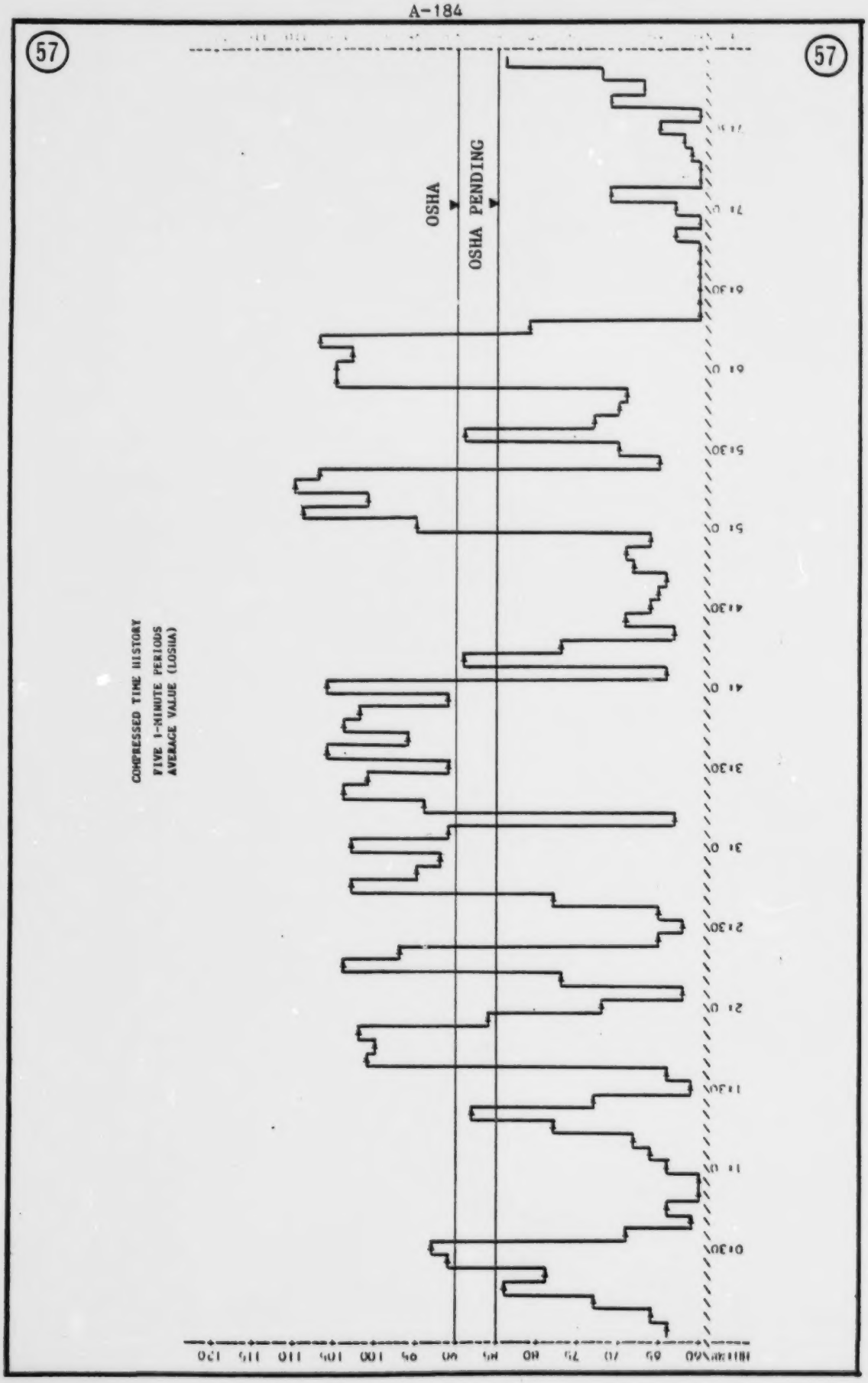
(57) AMPLITUDE DISTRIBUTION (57)



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
234	48.8	60 TO 64
41	8.5	65 TO 69
39	8.1	70 TO 74
17	3.5	75 TO 79
28	5.8	80 TO 84
11	2.3	85 TO 89
19	4.0	90 TO 94
12	2.5	95 TO 99
26	5.4	100 TO 104
38	7.9	105 TO 109
15	3.1	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


57
57
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
0:30
1: 0
1:30
2: 0
2:30
3: 0
3:30
4: 0
4:30
5: 0
5:30
6: 0
6:30
7: 0
7:30
65
70
75
80
85
90
95
100
105
110
115
120

58

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1213    60    64     4     1
      381     115200   480
  64  61  61  79  66  67  66  71  60  71  78  71  72  69  61  68
  78  60  74  82  82  90  88  85  85  79  82  83  77  89  86  91
  93  94  91  96  92  98  89  77  76  60  60  77  71  65  60  70
  65  72  71  60  60  64  60  70  63  76  60  60  60  60  60  60
  60  75  73  60  85  72  60  65  72  75  83  60  60  60  60  60
  60  60  73  66  60  60  60  60  61  60  60  60  60  60  60  60
  67  68  69  60  77  70  61  70  70  83  96 101  95  98 102  93
  98  78  78  90  88  87  84  87  89  74  65  61  88  90  60  60
  60  60  60  60  60  60  60  60  60  65  61  70 103 110 112 104
 110  82  93  81 107  76  66  62  66  62  71  68  64  63  66  67
  62  65  66  73  65  68  75  61  93 111 110 111 109  74 106 107
  89  71  70  62  60  95  86 106 109 107 108 109 107 107  87  61
  60  60  61  73  79  67  60  60  60  64  83  61 102 102 100  60
 100 104 103  93  79  90  80  84  60  60  99 103 101  99 100 104
 104  87  61  67  60  60 100 109 107 107 102 111  99  94  99  66
  69  61  78 111 110 108 106 109  76  72  66  64  70  66  70  73
  74  76  99  87  68  74  75  71  75  74  66  75  64  68  65  60
  60  74  72  64  63  63  60  69  71  73  65  66  62  64  60  60
  75  84  60  67  81  71  65  79  82  83  80  81  87  84  60  60
  60  60  60  60  60  60  60  60  60  81  91  92  86  67  60  61
  73  96  99  98 101  97  94  84  74  60  70  69  68  60  61  64
  60  60  63  66  87  84  95  94  78  80  78  68  78  82  80  75
  81  83  78  77  82  83  85  74  79  97 111 105 110 106  80  83
  83 100 106  84 114 100 112 104  84  95  71  60  60  62  65  60
  60  60  60  62  60  60  62  60  60  60  60  68  60  60  60  60
  71  68  67  60  66  60  60  61  61  60  60  60  60  60  60  60
  60  62  60  60  60  67  76  71  79  78  62  61  62  62  60  61
  62  60  60  60  68  64  71  73  77  77  74  76  74  66  63  72
  69  86  61  64  62  82  71  74  78  75  70  71  78  78  62  60
  60  61  71  78  61  60  60  64  85  60  69  60  60  60  87  94
%EOF
```

58

```
ENTER LOG DATE (DD/MM/YR) : 30/07/79

ENTER SITE CODE (5 CHARS) : 29003

ENTER USER CODE (4 CHARS) : 4636
 ENTER JOB CODE (3 CHARS) : 272
```

```
   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 29003
SERIAL NUMBER : 1213                       JOB CODE : 272
     BASELINE : 60 DB                     USER CODE : 4636
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 1:35
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	82.6	82.6	4.492	4.49
2	84.6	83.7	5.939	10.43
3	97.6	91.5	35.810	46.24
4	99.6	94.5	47.453	93.69
5	92.0	94.1	16.423	110.12
6	85.5	93.2	6.703	116.82
7	95.7	93.6	27.572	144.39
8	74.9	92.7	1.540	145.93

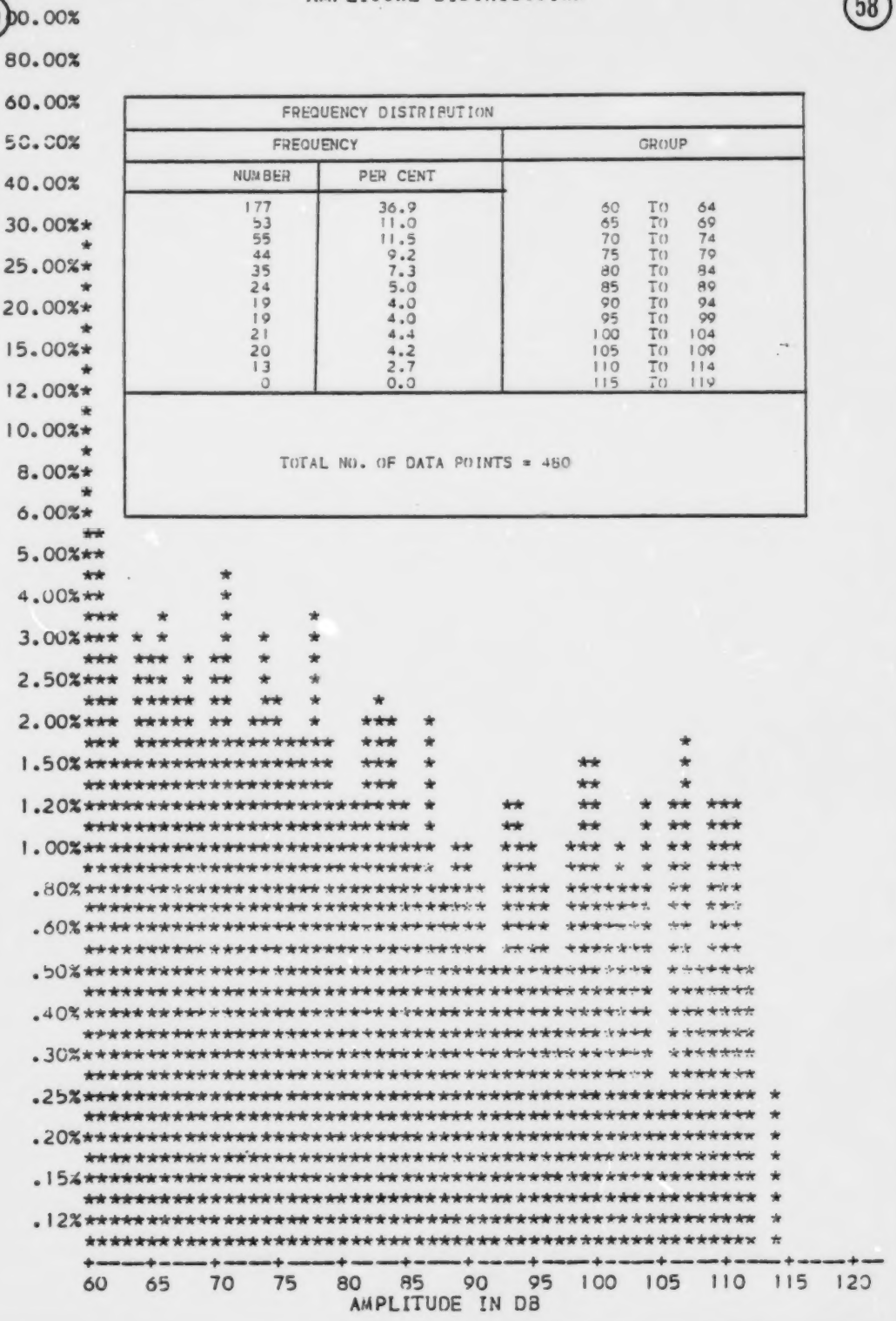
```
MIN. COMP. =  60 DB          MAX. COMP. = 114 DB
ARITHMETIC MEAN =  74 DB
STD. DEVIATION =  15 DB
VARIANCE =225 DB
```

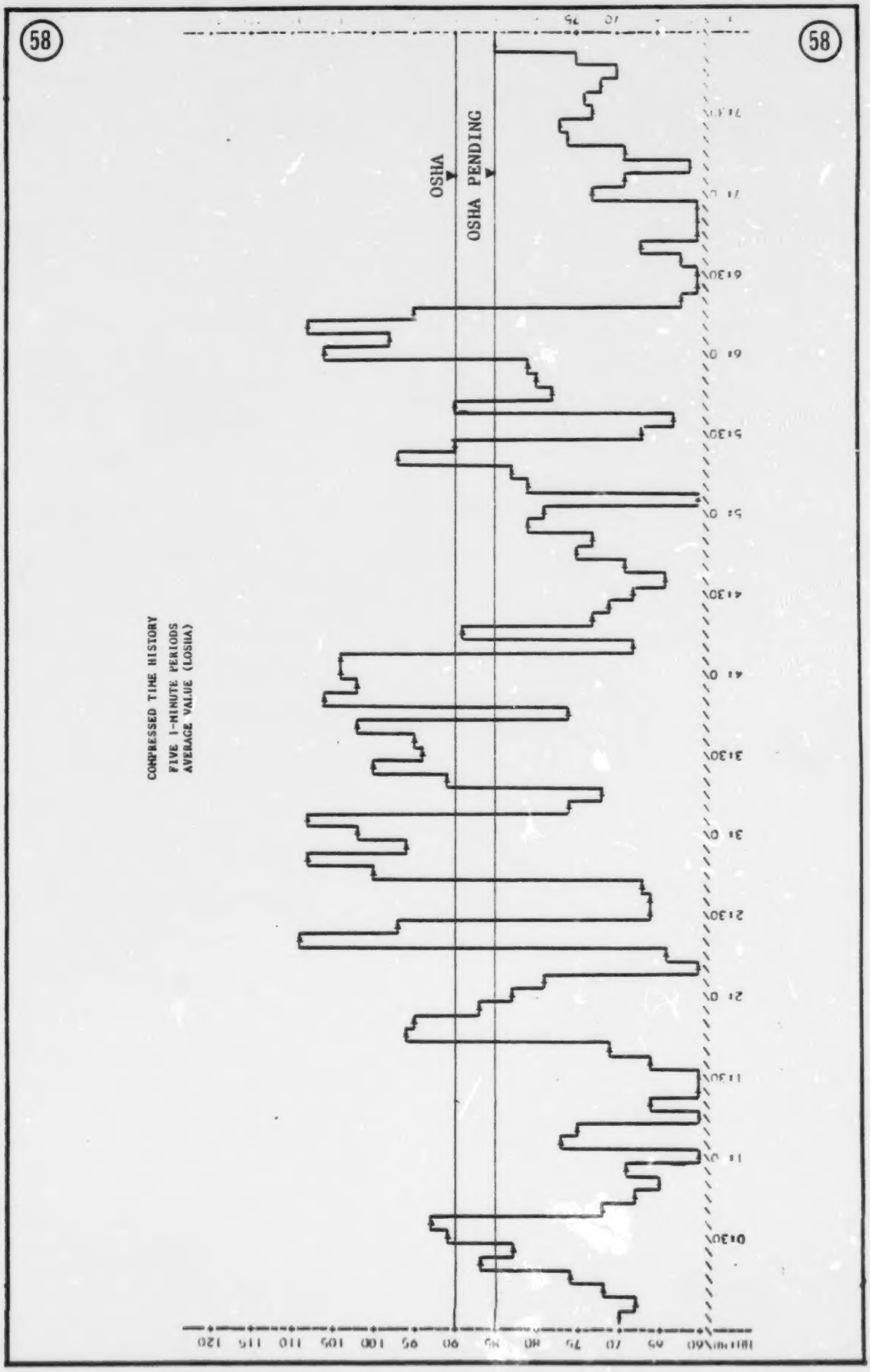
AMPLITUDE DISTRIBUTION

(58) (58)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
177	36.9	60 TO 64
53	11.0	65 TO 69
55	11.5	70 TO 74
44	9.2	75 TO 79
35	7.3	80 TO 84
24	5.0	85 TO 89
19	4.0	90 TO 94
19	4.0	95 TO 99
21	4.4	100 TO 104
20	4.2	105 TO 109
13	2.7	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




58
58
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
0:30
1: 0
1:30
2: 0
2:30
3: 0
3:30
4: 0
4:30
5: 0
5:30
6: 0
6:30
120
115
110
105
100
95
90
85
80
75
70
65
60

(59)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1215    60    64     4     1
        98     115200   480
  60  60  60  60  67  62  63  60  60  60  60  64  60  60  60  60
  67  60  60  60  60  61  60  60  60  60  60  60  60  60  67  67
  69  74  67  66  61  60  62  62  76  77  75  86  97  93  88  83
  91  89  82  82  83  84  81  82  81  81  82  82  82  81  82  81
  82  84  83  81  80  87  75  74  81  78  79  81  95 100 103  82
  81  85  95 101  93 105  98  81  70  67  71  79  81  83  69  70
  68  62  77  71  63  70  66  66  66  65  75  65  73  71  69  69
  75  75  63  68  60  60  64  97  93 101 104 103  92 104  96 104
 104 105 100  99 109 103  62  64  64  68  61  69  63  60  60  60
  75  66  68  96  60  63  75  80  69  73  74  93 103 103 102  98
  99  92  98  62  60  69  75  74  74  73  80  74  78  80  70  69
  69  70  64  69  62  60  60  68  60  70  62  84  81  72  78  88
  83  84  85  85  90  84  70  64  88  61  80 114 113 110  88 109
 113 103  95  77 111 112 113 115 112 112 114 112  99  96  96  90
  92  94 102 113 109 111 113 110 106  95  97  95  96 104 112 113
 115 116 113 112  93  95  95  94  93  92  60  60  60  72  73  70
  73  60  60  60  60  60  60  61  60  60  60  60  60  68  60  60
  60  60  60  60  60  60  60  60  60  60  60  64  71  60  63  68
  61  60  60  76  60  60  60  60  60  60  60  69  72  64  60  60
  71  61  60  60  69  66  60  60  61  60  60  62  60  65  65  60
  60  62  71  79  67  67  76  66  66  74  64  75  68  69  73  69
  60  60  60  63  72  61  60  60  60  60  60  63  61  78  62  61
  76  70  61  66  61  60  62  61  72  79  78  74  67  68  74  74
  65  62  60  60  60  67  76  79  67  67  96  98  97 100 100 103
 112 110 112 113 110  92 101  98 100 101  98  99 100  91  97  98
  92  98  99  95  96 100  95  98 100  94  98  97 100  79  76  94
  97  97  92  96  98  99  92 103 112 114 114 112 113  94  94 114
 117 115 113  99 113 108 103 109 101 100 112 116 113 114 111 101
 109  99 102  88  85  75  72 107  74  92  77  83  72  77  68  65
  74  61  60  74  66  68  60  60  60  60  60  60  67  67  72  77
%EOF


ENTER LOG DATE (DD/MM/YR) : 20/08/79
ENTER SITE CODE (5 CHARS) : 29003
ENTER USER CODE (4 CHARS) : 4549
 ENTER JOB CODE (3 CHARS) : 272

   DATA LOGGED :20  AUG 1979          DATA ANALYZED : 25 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 29003
SERIAL NUMBER : 1215                       JOB CODE : 272
     BASELINE : 60 DB                    USER CODE : 4549
DYNAMIC RANGE : 64 DB                   THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0:24

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                        DOSE
HOUR    CURRENT   CUMULATIVE        CURRENT   CUMULATIVE
   1      78.7       78.7           2.623       2.62
   2      87.5       84.4           8.867      11.49
   3      94.6       89.6          23.748      35.24
   4     105.2       97.3         102.752     137.99
   5      95.3       97.0          26.176     164.16
   6      67.0       95.7            .514     164.68
   7      98.8       96.2          42.591     207.27
   8     105.4       98.2         105.271     312.54
MIN. COMP. =  60 DB                MAX. COMP. = 117 DB
ARITHMETIC MEAN =  79 DB
STD. DEVIATION =  18 DB
VARIANCE =324 DB
```

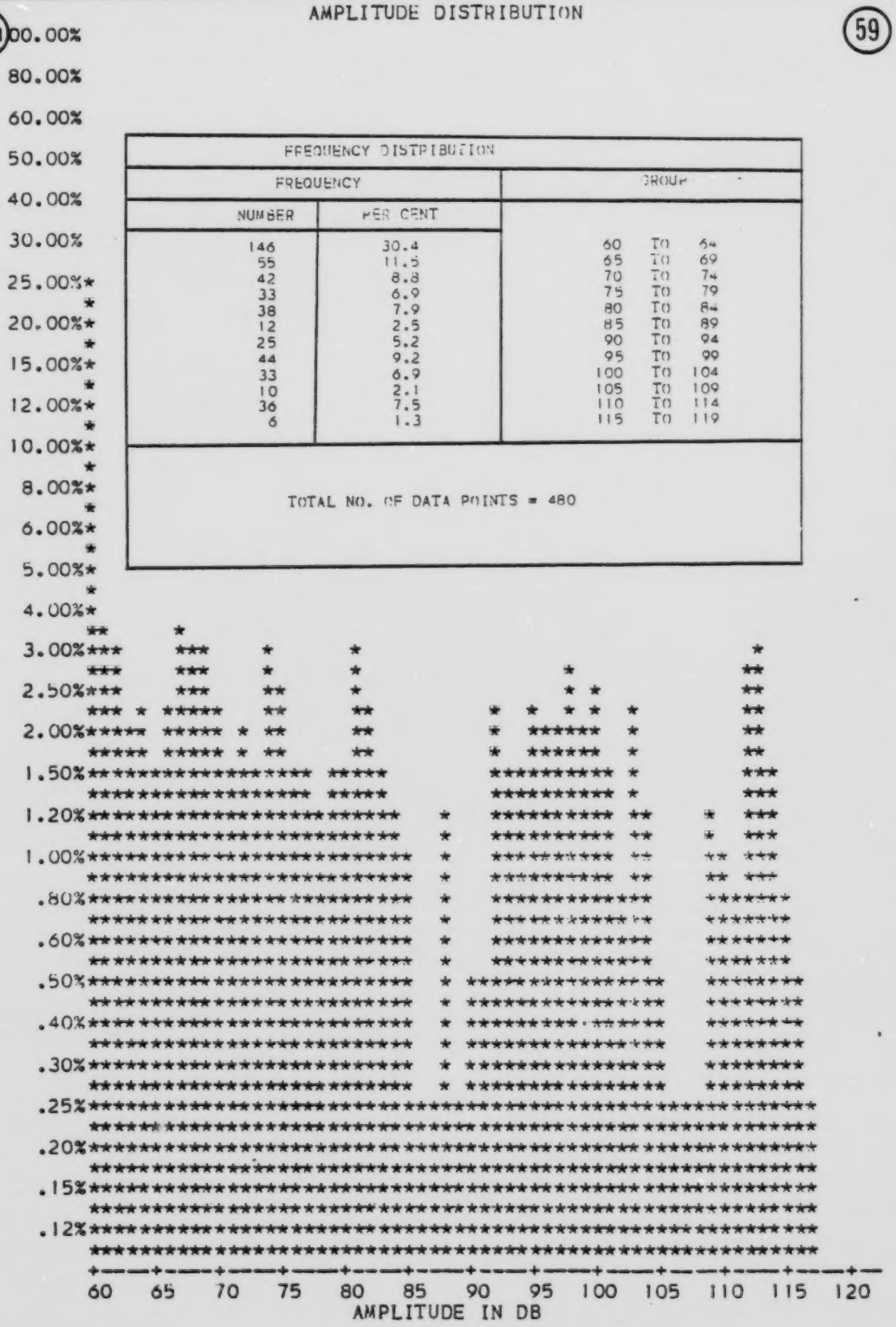
(59)

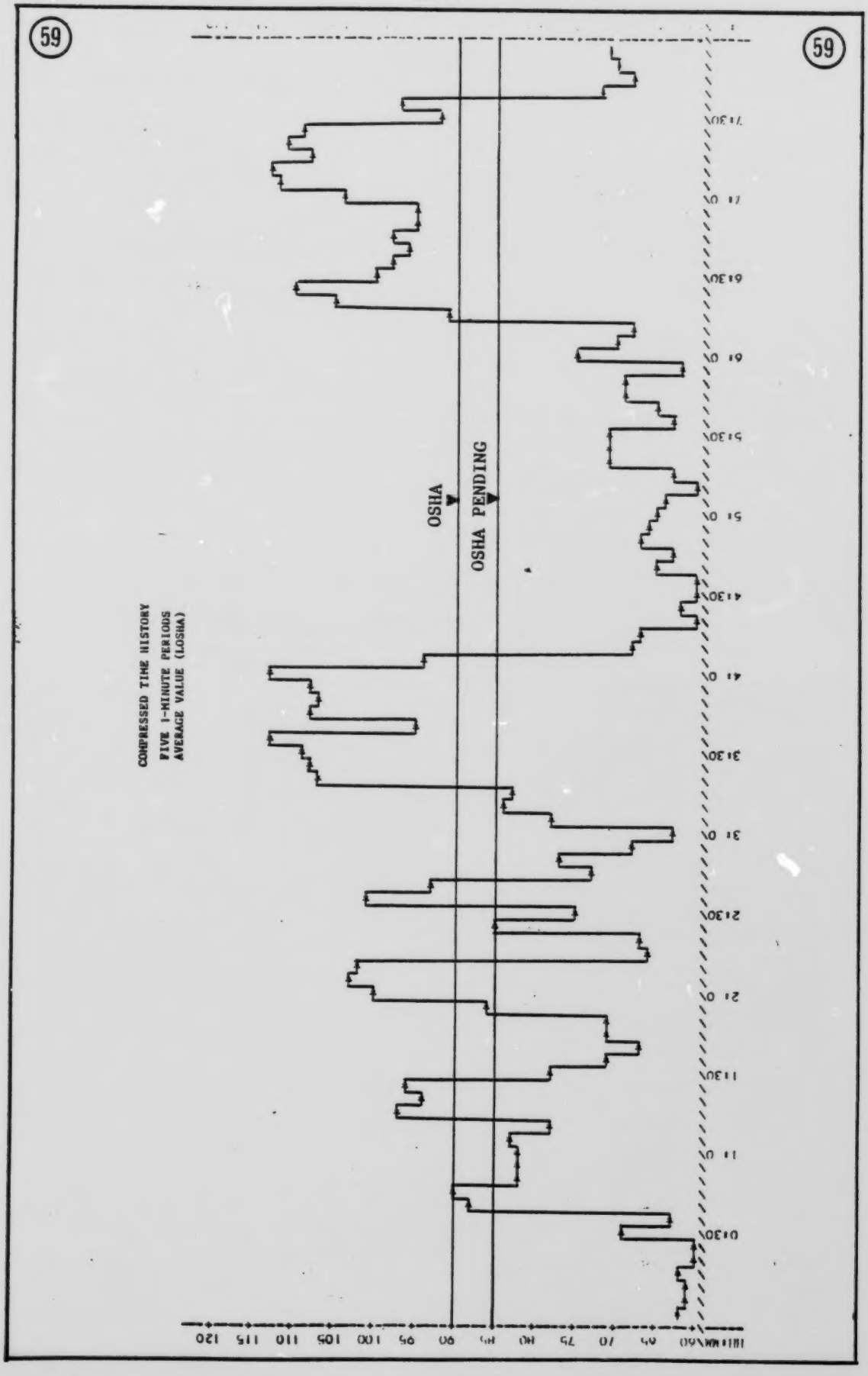
AMPLITUDE DISTRIBUTION

(59) (59)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
146	30.4	60 TO 64
55	11.5	65 TO 69
42	8.8	70 TO 74
33	6.9	75 TO 79
38	7.9	80 TO 84
12	2.5	85 TO 89
25	5.2	90 TO 94
44	9.2	95 TO 99
33	6.9	100 TO 104
10	2.1	105 TO 109
36	7.5	110 TO 114
6	1.3	115 TO 119

TOTAL NO. OF DATA POINTS = 480




59
59
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
7:30
7: 0
6:30
6: 0
5:30
5: 0
4:30
4: 0
3:30
3: 0
2:30
2: 0
1:30
1: 0
0:30
DBA re 60
65
70
75
80
85
90
95
100
105
110
115
120

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1217   60   64    4    1
     521     115200  480
 60  60  60  60  60  60  62  60  60  60  60  60  60  60  60  60
 60  60  72  67  66  65  65  66  78  83  84  89  92  93  90  93
 98  98  99  91  96  94  96  94  96  99  93  92  88  91  94  88
 73  62  60  60  60  60  60  60  80  72  60  60  69  63  74  79
 68  73  68  79  78  97  95  67  60  64  60  61  67  61  60  62
 60  64  67  60  60  99 110 106  68  72  73  64  68  70  62  62
 71 100 109 106 108 109  98  96  74  60  61 104  98 106 107 108
110 102 110  97 111 108 107 108 109  72  90  71  67 109 106  90
 83  82 110 108 112 108 110 111 109 110 109 111 105 106 101  75
 83 104 105  90  61  89  83 108 104 107 105 103 109 105 101  88
 75  67  61 102 108 104 109 106 106  73 106 103  68  86  64 108
106 102 104 101 101  98  60  82  70  63  60  63  62  69  72  60
 60  60  62  64  60  60  60  60  60  60  60  60  60  60  60  72
 69  60  61  82  87  81  82  85  78  78  60  60  60  60  60  65
 60  60  69  75  82  78  76  80  63  60  60  61  72  69  73  64
 60  62  60  60  60  60  62  60  60  60  72  78  67  60  62  66
 60  60  60  68  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  66  60
 60  60  62  60  60  60  60  60  61  60  60  60  60  60  60  60
 67  60  60  60  60  60  61  60  60  60  60  60  62  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  62  84  85  83
 83  85  82  83  82  82  84  80  83  78  74  71  77  61  60  60
 61  60  60  72  70  60  81  82  84  86  84  82  86  80  80  75
 68  79  86  84  83  77  73  70  72  71  68  65  83  75  84  79
 82  76  81  69  71  68  73  69  68  62  60  64  68  70  63  62
 60  60  60  66  68  66  74  63  61  60  60  60  60  60  62  60
 60  62  62  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  73  61  61  60  64
%EOF


ENTER LOG DATE (DD/MM/YR) : 20/08/79
ENTER SITE CODE (5 CHARS) : 32016

ENTER USER CODE (4 CHARS) : 4693
 ENTER JOB CODE (3 CHARS) : 272


   DATA LOGGED :20  AUG 1979          DATA ANALYZED : 25 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : 32016
 SERIAL NUMBER : 1217                      JOB CODE : 272
      BASELINE : 50 DB                    USER CODE : 4693
 DYNAMIC RANGE : 64 DB                   THRESHOLD : 60 DB
 SAMPLING RATE :  4/SEC            TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0          STANDBY TIME =   0: 2:10

            TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

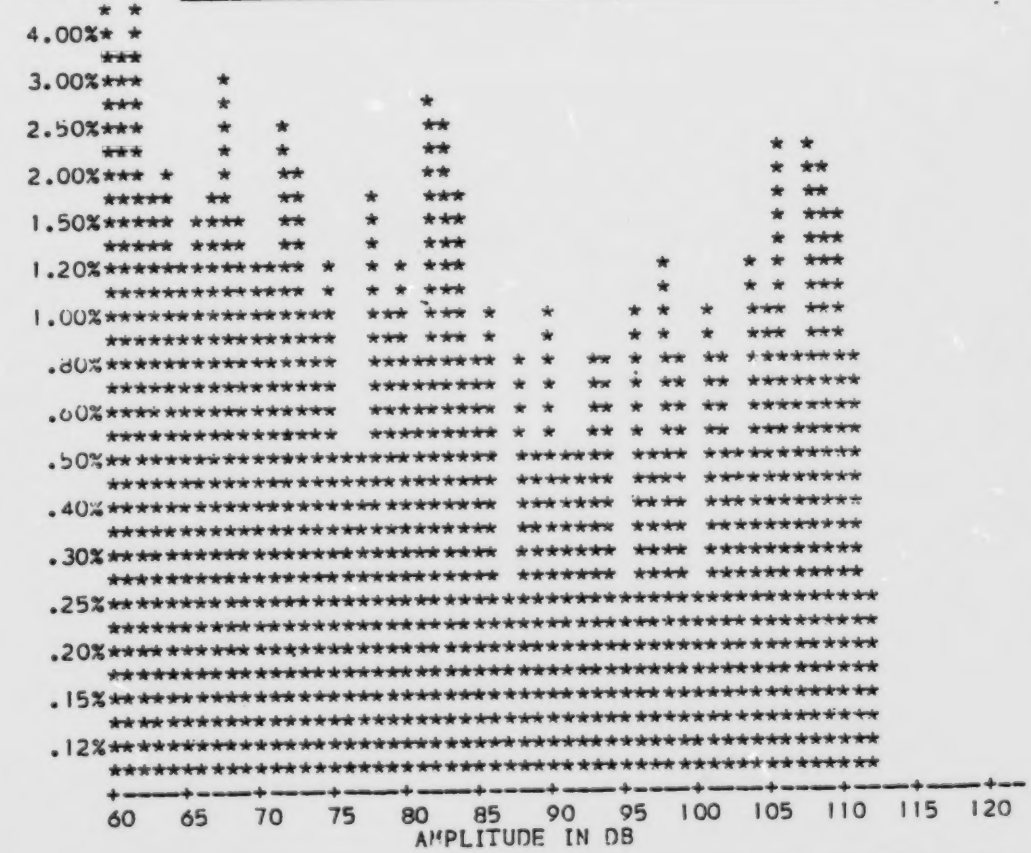
TIME          LOSHA                        %DOSE
HOUR    CURRENT  CUMULATIVE        CURRENT  CUMULATIVE
   1      87.1       87.1          8.357       8.36
   2      99.7       95.8         47.652      56.01
   3     104.0       99.7         87.386     143.40
   4      78.6       97.7          2.650     146.04
   5      62.2       96.1           .265     146.31
   6      60.5       94.8           .208     146.52
   7      79.1       93.9          2.766     149.28
   8      63.7       92.9           .327     149.61
MIN. COMP. =  60 DB              MAX. COMP. = 112 DB
ARITHMETIC MEAN =  72 DB
STD. DEVIATION =  16 DB
VARIANCE =256 DB
```

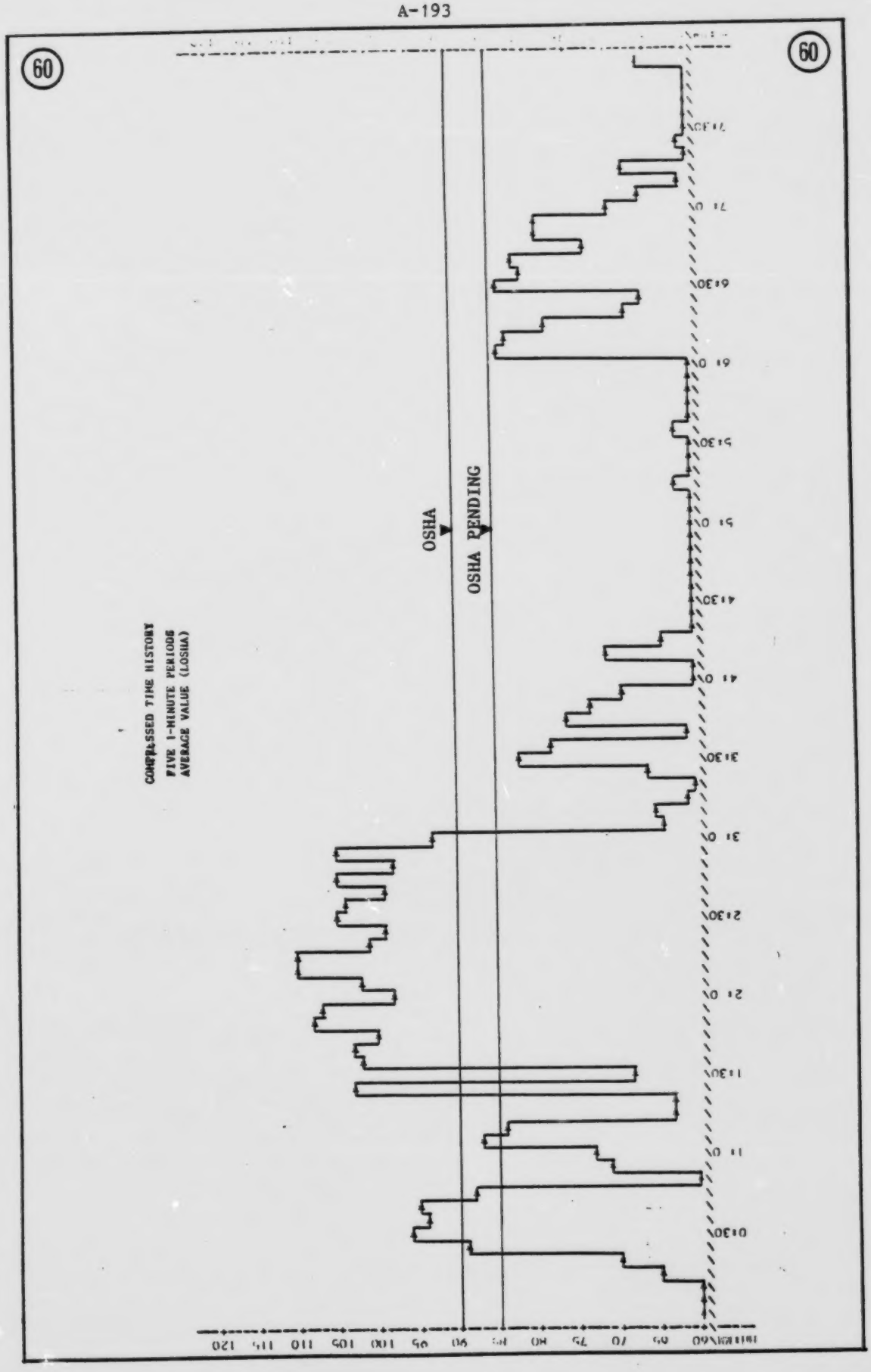
AMPLITUDE DISTRIBUTION

(60) (60)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
256	53.3	60 TO 64
36	7.5	65 TO 69
32	6.7	70 TO 74
20	4.2	75 TO 79
36	7.5	80 TO 84
13	2.7	85 TO 89
14	2.9	90 TO 94
15	3.1	95 TO 99
15	3.1	100 TO 104
33	6.9	105 TO 109
10	2.1	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




60
60
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
MINIMUM 60 65 70 75 80 85 90 95 100 105 110 115 120
0:30
1: 0
1:30
2: 0
2:30
3: 0
3:30
4: 0
4:30
5: 0
5:30
6: 0
6:30
7: 0
7:30

(61)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1212   60   64    4    1
     29     115200  480
 69  60  60  60  60  75  62  71  62  61  62  63  60  60  68  69
 65  81  83  82  90  84  81  80  77  81  82  81  88  85  93  93
 95  95  98  95  99  88  92  99  95  96 100  87  91  97  97  96
 98  91  81  61  60  60  60  60  60  60  63  63  64  61  61  61
 72  68  77  74  76  70  73  74  69  74  67  60  62  68  76  80
 73  70  73  75  70  69  79 109 106 108 106 110 104  92  88  85
 84  78  62  60  68  72  72  80  89  90  89  85  88  75  69  78
111 108 112 109 108 112 100  85 106  94  88 109 111 108 110 107
 95 112 110 110 111 113 111 110 109 111 111 108  76  75  66  63
 71  75  72 108  81  91  95  82  93 105 110 111 111 110 109  85
112  93 101 110  99 112 109 112 110 108 111  91  94 103  93 109
111 110 111 113 110 111 113 110 111 112 109 105 112  96  94 110
109 109 112 112 113 114 111 112 113 112 114 110 107 111 110 114
110 115 115  96  91  92  92  94 109  83  80 107 109 112 103  88
 98 106 114 108  88  84  88  92 109 106 105 113  83 103 112 109
105  82  70  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  67  60  60  60  60  60  60  60  60  60  60  60  61  61  62
 60  63  60  67  66  67  68  60  70  60 102 110 107 105  86  93
 72  70  76  61  60  61  64  69  71  70  68  60  60  69  62  65
 63  65  73  62  63  66  72  70  66  73  68  75  75  60  60  81
 91  90  90  88  91 102 102 105 109 103 109  96 108 108 107 109
106 108 108  96  90 111 103 111 111 108 102  93 102 107 109 111
111 110 111 110 109 109 109 107 110  95  96 111 109 110 108 108
111 111 110 109 109 111 109 110 110 112 108 109 109 109 108 106
110 108 108 104  88  86  76  88  89  89  92  91  94  80 108 105
 94 109  83  73  71  72  70  74  67 109 110 109 111 112 108 110
105 111 110 103  67  93  91  92  88  75  73  79  82  78  74  70
 60  64  62  62  60  61  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  68  64  67  60  60  61  61  60  60  60  60
 60  60  69  65  63  73  68  83  84  80  89  86  88  96  94  91
%EOF
```

(61)

```
ENTER LOG DATE (DD/MM/YR) : 30/07/79
ENTER SITE CODE (5 CHARS) : 32950
ENTER USER CODE (4 CHARS) : 4766

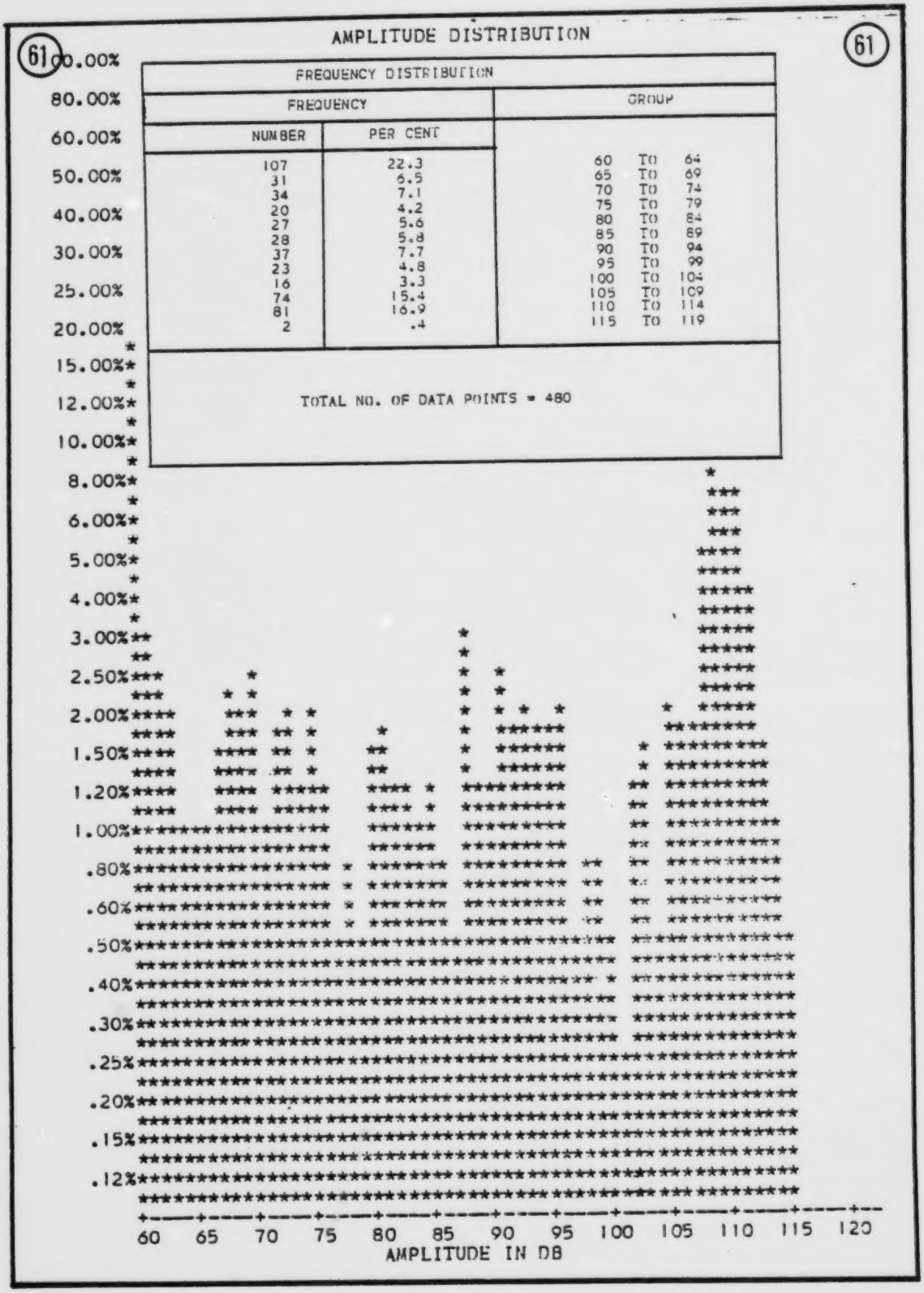
 ENTER JOB CODE (3 CHARS) : 272
```

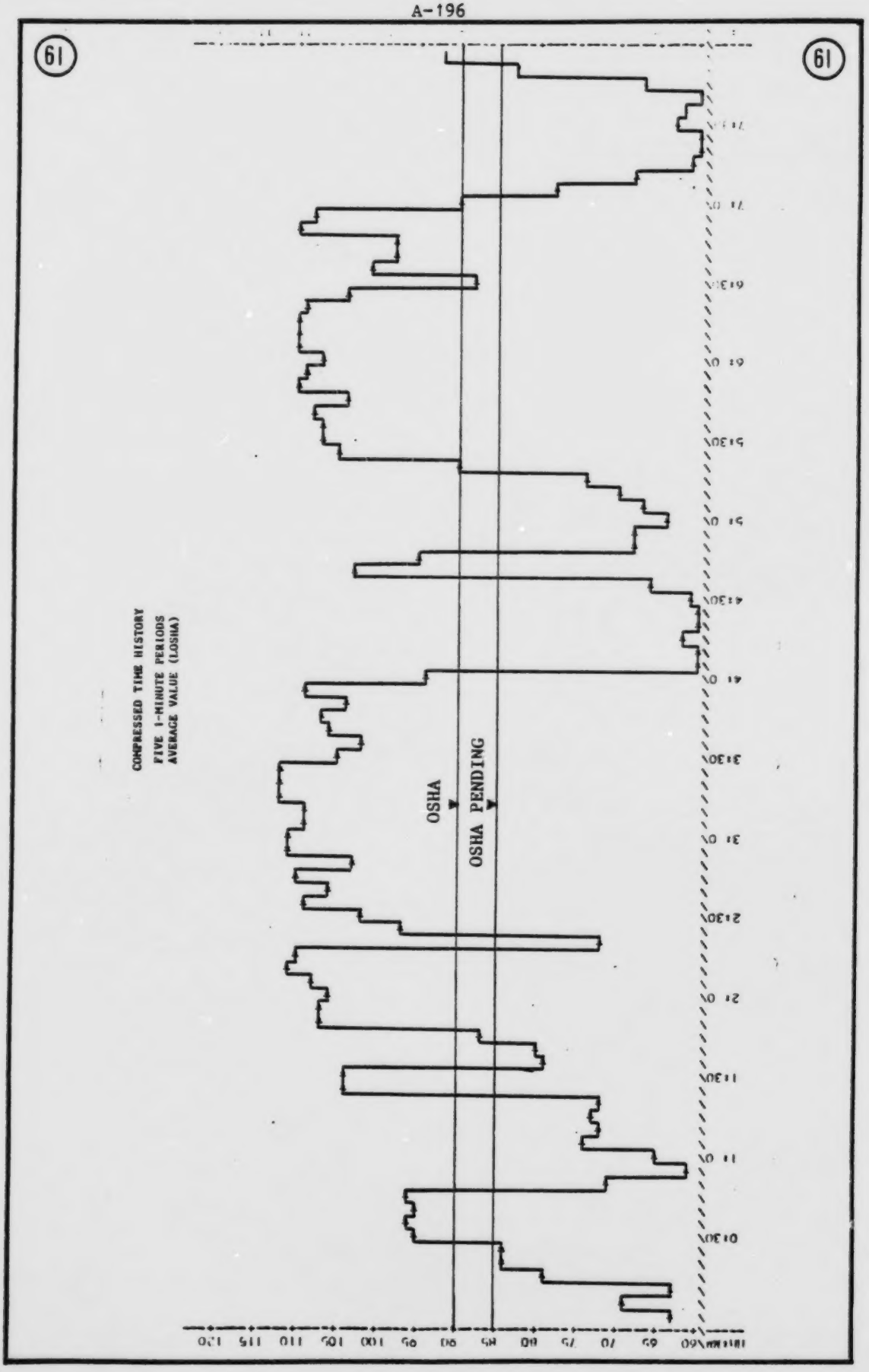
```
   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 32950
SERIAL NUMBER : 1212                       JOB CODE : 272
     BASELINE : 60 DB                      USER CODE : 4766
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0: 7

          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                    %DOSE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1        88.6        88.6       10.269       10.27
   2        98.0        94.7       37.716       47.98
   3       107.0       101.3      132.830      180.81
   4       108.8       104.0      168.339      349.15
   5        88.9       102.6       10.779      359.93
   6       103.6       102.8       82.481      442.41
   7       106.5       103.5      122.280      564.69
   8        80.1       102.5        3.176      567.87
MIN. COMP. =  60 DB                MAX. COMP. = 115 DB
ARITHMETIC MEAN =  86 DB
STD. DEVIATION =  20 DB
VARIANCE =400 DB
```


AMPLITUDE DISTRIBUTION
61
61
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
107 22.3 60 TO 64
31 6.5 65 TO 69
34 7.1 70 TO 74
20 4.2 75 TO 79
27 5.6 80 TO 84
28 5.8 85 TO 89
37 7.7 90 TO 94
23 4.8 95 TO 99
16 3.3 100 TO 104
74 15.4 105 TO 109
81 16.9 110 TO 114
2 .4 115 TO 119
TOTAL NO. OF DATA POINTS = 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


61
61
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:30
2:30
3:30
4:30
5:30
6:30
7:30
60
65
70
75
80
85
90
95
100
105
110
115
120

62

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1213    60    64     4     1
     103     115200  480
 61  65  60  60  60  63  62  60  61  63  62  64  60  70  73  72
 70  68  60  60  60  61  65  60  61  60  65  70  72  60  60  60
 60  65  60  65  67  60  67  69  75  93  92  92  96  92  94  92
 91  92  95  87  86  87  91  87  76  72  60  60  60  60  60  60
 60  60  60  60  60  60  60  62  60  60  62  60  60  61  70  60
 60  60  60  60  60  60  60  75  75  75  73  62  61  70  62  60
 62  66  64  71  61  69  73  71  69  70  63  61  66  77  89  87
 64  68  64  68  65  61  60  65  60  60  60  60  60  78  90  94
 86  60  60  60  62  72  66  63  74  71  77  78  67  69  68  84
 80  78  73  90  96  90  82  80  60  60  78  60  61  60  74  84
 85  85  96 105  78  75  85  78  91  83  67  86  79  60  79  77
 82  81  77  75  75  77  73  76  74  78  76  69  76  76  67  74
 73  76  72  72  70  66  63  71  80  79  69  71  75  74  70  69
 85  94  90  91  84  86  93  90  66  69  75  66  71  79  79  85
 88  75  68  75  69  64  78  90  89  60  87  97  95  96 109 105
100 100 100  99 101  99 101 100 100  99  96  95  95  85  90  93
 90 102 100 100  98  99 100 103 100  71  72  60  60  60  60  60
 60  60  60  60  60  60  63  63  63  69  62  60  60  60  67  71
 77  82  82  74  74  76  60  70  77  81  77  78  86  90  86  85
 99  97  99 105 115 117 117 117 115 117 116 117 116 110  96  94
 99  99  99  99  95  90  90  95  83  83  82  81  81  84  80  82
 84  82  65  60  69  82  92  66  87  96  97  96  96  98  98  97
 98  96  97  97  97  98  98  97  96  97  97  97  97  97  98  93
 90  99 112 115 114 115 114 113 113 113 113 113 113 113 114 111
 85 105 112 103 106 103  90  87  86  84 107 106 104 111 111 107
106 102  73  86 100 100  89  91  90  90  92  90  91  90 114 105
 95 104 111 111 114  97  98 100  77  60  60  90  60  80  98 103
105  91  65  60  62  65  60  60  67  63  63  60  60  63  61  60
 60  60  61  60  60  61  65  60  67  62  62  60  60  60  61  60
 80  80  86  75  76  64  62  66  65  67  74  82  85  91  94  94
%EOF



ENTER LOG DATE (DD/MM/YR) : 22/08/79
ENTER SITE CODE (5 CHARS) : 35950
ENTER USER CODE (4 CHARS) : 7289

 ENTER JOB CODE (3 CHARS) : 270


   DATA LOGGED :22  AUG 1979          DATA ANALYZED : 25 SEPT 1979
       LOGGER : DB-301/2C                SITE CODE : 35950
SERIAL NUMBER : 1213                      JOB CODE : 270
     BASELINE : 60 DB                   USER CODE : 7289
DYNAMIC RANGE : 94 DB                   THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC             TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0           STANDBY TIME =   0: 0:25


            TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOGA                          DOSE
HOUR     CURRENT  CUMULATIVE          CURRENT  CUMULATIVE
   1        82.3       82.3            4.294        4.29
   2        70.3       78.5             .814        5.11
   3        84.9       81.3            6.134       11.24
   4        87.9       83.6            9.367       20.61
   5        92.6       86.5           17.817       38.43
   6       104.6       94.1           94.776      133.20
   7       106.9       97.9          129.619      262.82
   8        90.6       97.3           13.524      276.35
MIN. COMP. =  60 DB                MAX. COMP. = 117 DB
ARITHMETIC MEAN =  79 DB
STD. DEVIATION =  17 DB
VARIANCE =289 DB
```

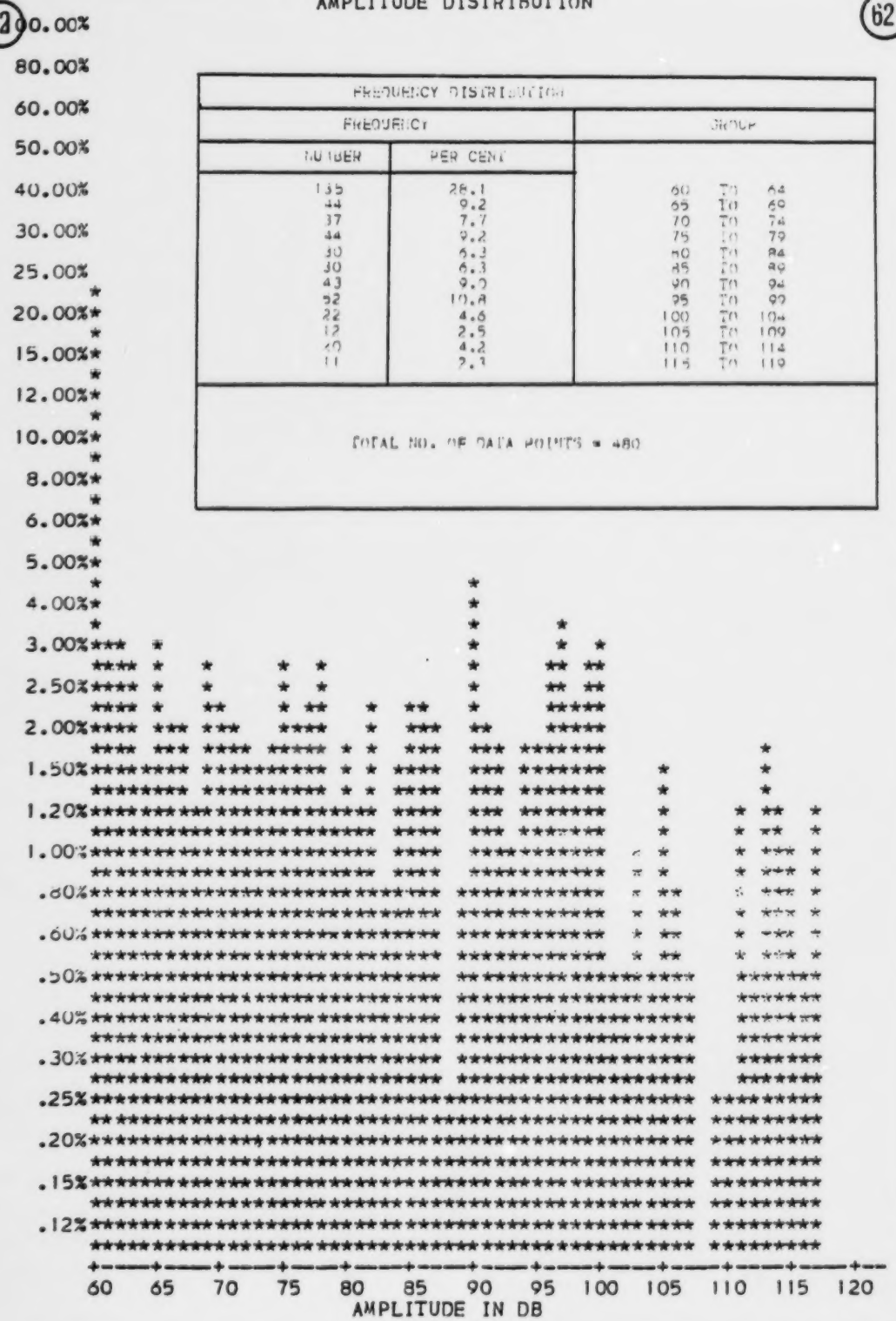
62

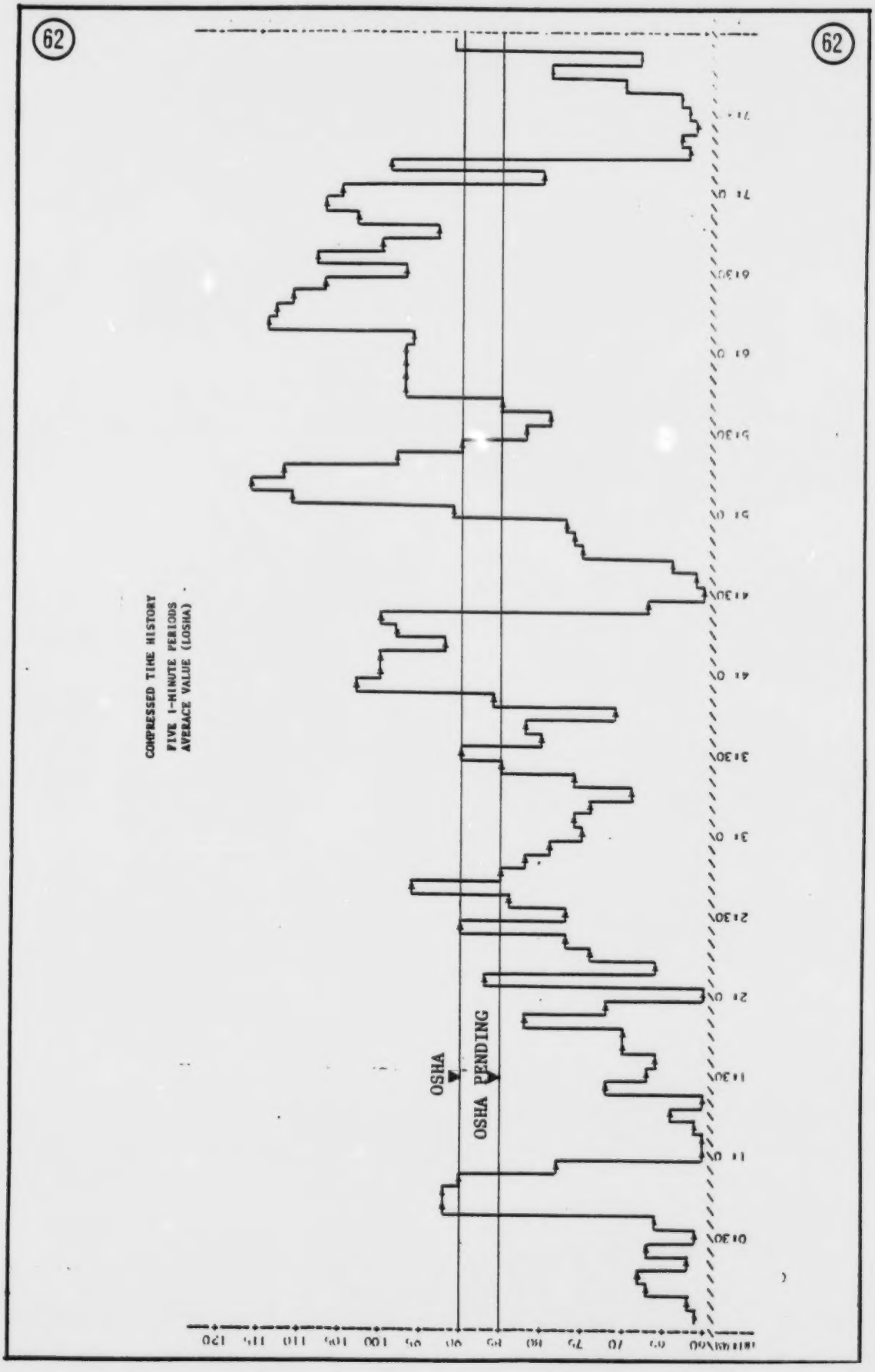
AMPLITUDE DISTRIBUTION

(62) (62)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
135	28.1	60 TO 64
44	9.2	65 TO 69
37	7.7	70 TO 74
44	9.2	75 TO 79
30	6.3	80 TO 84
30	6.3	85 TO 89
43	9.0	90 TO 94
52	10.8	95 TO 99
22	4.6	100 TO 104
12	2.5	105 TO 109
20	4.2	110 TO 114
11	2.3	115 TO 119

TOTAL NO. OF DATA POINTS = 480




62
62
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
7h 0%
7h 30%
6h 0%
6h 30%
5h 0%
5h 30%
4h 0%
4h 30%
3h 0%
3h 30%
2h 0%
2h 30%
1h 0%
1h 30%
0h 0%
0h 30%
dBA re 20 uPa
65
70
75
80
85
90
95
100
105
110
115
120

(63)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(63)

```
  1  26  80  1218    60    64     4     1
     129     115200  480
 60  60  60  60  60  61  70  71  68  68  67  67  71  74  81  81
 88  88  83  83  80  81  85  79  87  90  90  93  97  90  96  93
 98  91  85  97  96  91  97  95  90  96  97  95  96  95  84  92
 95  96  93  95  80  65  67  63  65  68  64  73  71  65  61  64
 71  96  93  92  90  87  64  60  60  62  76  69  65  66  60  60
 60  89  89  88  89  88  88  87  88  89  83  87  89  88  93  87
 87 105 106  99 106 105 104 106 102 108 107  96  95  95  96 101
106  96 107 107 100 110 109 102 107 106  99  96  95  95  95  96
 95 104 106 102 105 104 103 107 106 101 108 107 106 100  95  95
 95  94  96  95  94  95 107 104 104 107 103 109 108 105 109 108
 96  96  95 101 108 100  94 102  64  60  68  60  64  60  60  60
 60  67  69  61  60  60  60  73  81  63  65  66  62  63  60  60
 61  62  64  65  85  86  80  76  64  63  62  76  60  63  60  66
 71  74  89  93 105 102 106 108 104 104 105 110 102  97  97  95
 96  95  96  94 107 103 104  98  98  95 105 104 105 106 106 107
106 109 106 103  95  97  93  91 102 106 105 100 106 105 105 106
105 109 108 107  94  94  95  96 107 107 105 106 101 107 102 104
105 106 102  96  96  96  96 107 106  95  95 106 104 102 107 102
111 109 108 103  97  97  96  96 109 107 110 109 109 107 106 110
110 105  97  97  95 106 108  97  95  96 106 112  98  88  88  95
 96  96  95 106 109 107 111 105 111 110 103  96  97  97  97  97
106 109 107 110 105 113 109 109 111 110  99  96  95  96  96 107
109 107 106 102 106 104 104 103 104  96  97  96  96  97 110 107
103 103 102 109 103 105 106 106 108  97  96  96  96  91  69  69
 62  64  69  65  66  73  70  66  72  61  69  69  73  81  67  71
 70  72  71  67  74  78  71  71  72  65  63  60  62  76  74  77
 88 107 108  95 108 109 103 104 108 106 110 112 106  95  96  95
 92  88  70  77  78  86  83  83  87  86  88  94  94  88  93  93
 92  80  74  69  75  74  70  70  69  76  76  73  72  72  65  70
 60  63  74  74  83  80  87  87  89  96  96  95  90  99  94  97
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 30/07/79
ENTER SITE CODE (5 CHARS) : 35950
ENTER USER CODE (4 CHARS) : 4768
 ENTER JOB CODE (3 CHARS) : 272
```

```
   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 35950
SERIAL NUMBER : 1218                       JOB CODE : 272
     BASELINE : 60 DB                     USER CODE : 4768
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:32
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	89.2	89.2	11.265	11.26
2	98.3	95.1	39.580	50.85
3	101.4	97.8	60.444	111.29
4	98.0	97.9	37.915	149.20
5	104.2	99.7	90.012	239.22
6	105.3	101.0	104.422	343.64
7	97.1	100.5	33.370	377.01
8	96.5	100.1	30.710	407.72

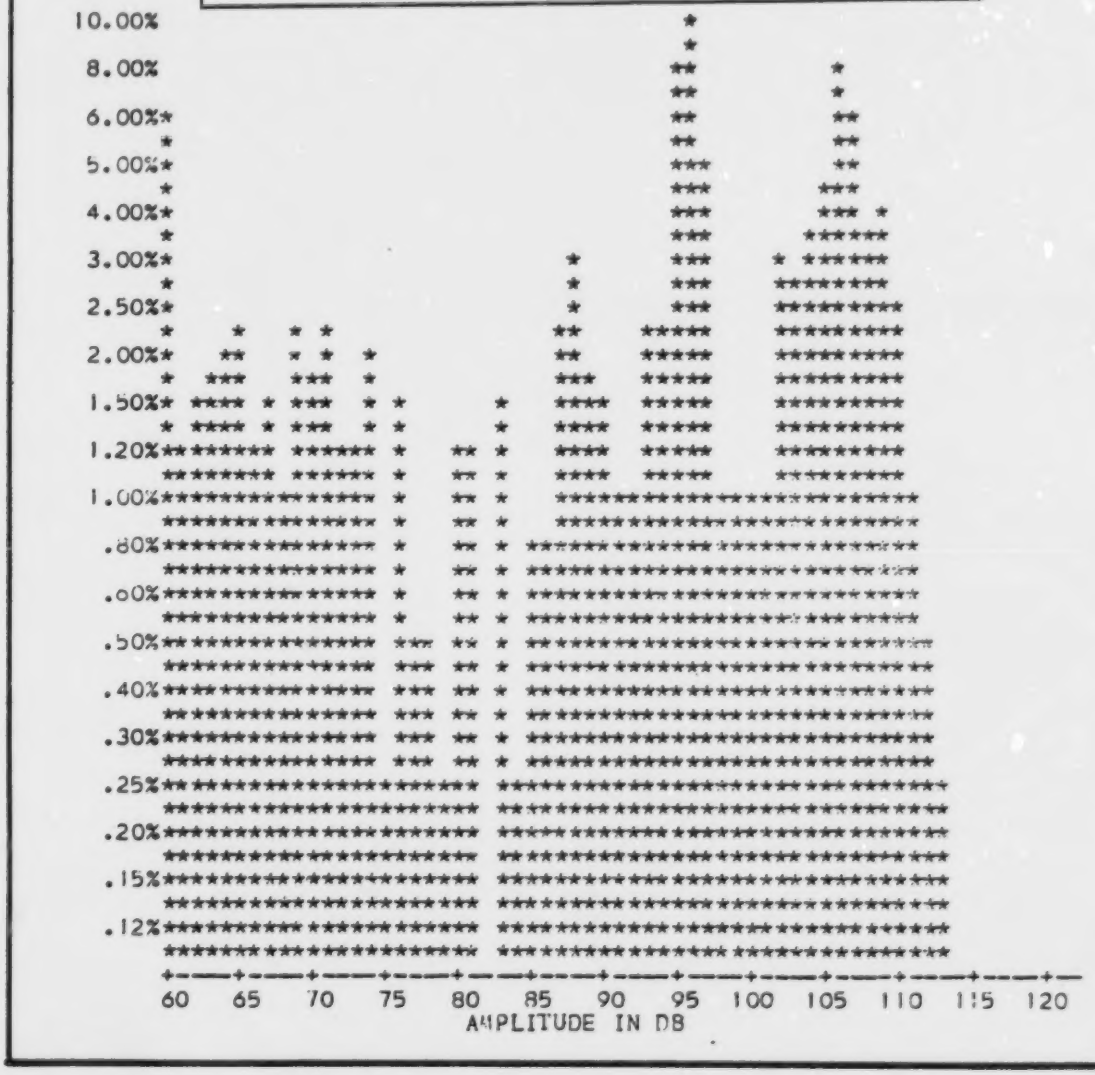
MIN. COMP. = 60 DB MAX. COMP. = 113 DB
ARITHMETIC MEAN = 90 DB
STD. DEVIATION = 16 DB
VARIANCE =256 DB

63

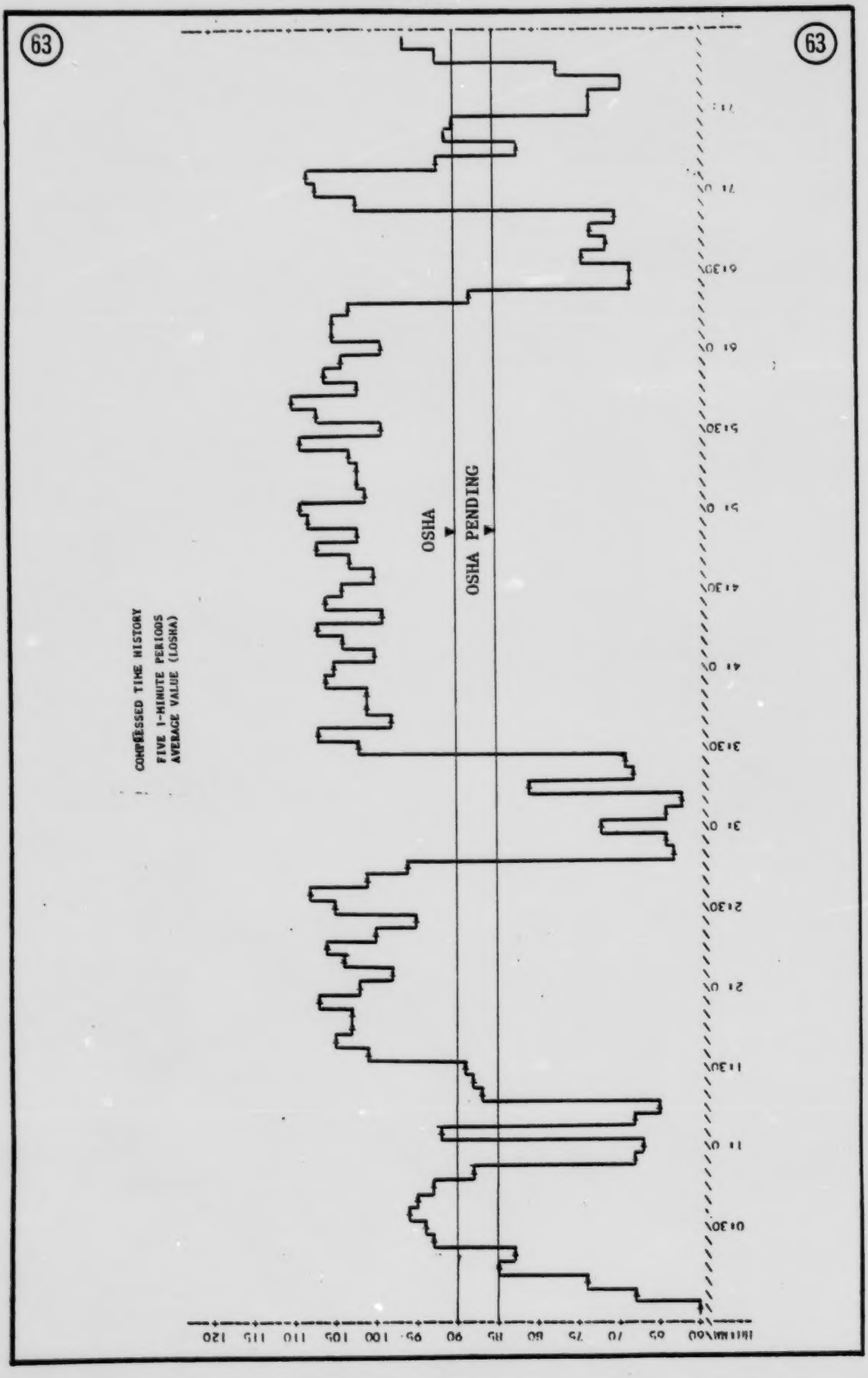
FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
51	10.6	60 TO 64
33	6.9	65 TO 69
34	7.1	70 TO 74
12	2.5	75 TO 79
17	3.5	80 TO 84
35	7.3	85 TO 89
32	6.7	90 TO 94
100	20.8	95 TO 99
47	9.8	100 TO 104
102	21.3	105 TO 109
17	3.5	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480



63


63
63
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
60
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00

(64)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1212 60 64 4 1
120 115200 480

60	60	63	61	60	60	60	60	68	61	60	60	61	60	71	65
63	66	60	60	60	60	70	70	60	67	93	96	91	95	87	84
86	82	88	91	91	92	91	87	78	65	60	69	62	60	60	60
60	60	60	60	60	60	60	60	60	60	63	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	75	76	78	71	66	60	62	67	60	78	86	87	82
83	82	80	78	71	83	91	72	79	83	83	81	85	91	90	93
83	82	82	82	81	81	84	85	68	62	60	66	62	67	68	66
62	61	67	67	69	62	86	74	60	65	63	64	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	64	60	63
60	60	62	65	64	62	61	62	72	69	60	60	60	60	60	61
62	60	60	60	60	60	60	60	62	60	60	60	62	65	61	67
64	60	60	65	63	68	64	60	60	62	66	63	60	60	60	61
60	60	67	69	70	83	80	74	65	64	61	70	68	69	73	81
76	81	80	79	92	89	81	80	80	80	80	80	82	81	60	68
60	60	60	60	62	61	60	60	60	60	60	60	69	74	77	60
60	60	60	60	82	60	60	60	60	60	76	62	61	60	60	76
60	83	68	60	60	60	61	60	60	75	75	75	76	70	72	82
78	71	77	80	78	83	60	60	60	81	68	60	60	60	60	60
60	76	83	83	84	84	84	84	85	85	85	83	85	86	86	86
85	84	84	84	84	84	84	84	84	84	84	84	84	84	84	84
84	84	83	81	85	83	86	86	86	86	86	86	86	86	86	80
83	80	79	70	88	90	83	78	79	79	75	78	79	79	81	90
92	78	82	61	62	70	66	64	66	68	77	96	95	92	88	87
85	80	83	76	80	81	82	87	86	95	98	94	88	77	60	66
62	60	66	61	60	60	60	60	60	60	61	60	60	76	76	94
60	72	75	73	86	97	97	98	98	99	99	99	99	98	94	76
68	62	62	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	61	60	60	60	62	60	60	65	61	65	72	96

$EOF

ENTER LOG DATE (DD/MM/YR) : 21/08/79
ENTER SITE CODE (5 CHARS) : 98013
ENTER USER CODE (4 CHARS) : 4608
ENTER JOB CODE (3 CHARS) : 272

DATA LOGGED :21 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1212
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 98013
JOB CODE : 272
USER CODE : 4608
THRESHOLD : 60 DB
TOTAL SAMPLES = 115200
STARDAY TIME = 0: 0:30

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	OSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	80.6	80.6	3.411	3.41
2	78.8	79.8	2.660	6.07
3	66.6	77.4	.485	6.56
4	75.0	76.9	1.554	8.11
5	71.4	76.1	.946	9.06
6	83.7	78.0	5.192	14.25
7	83.8	79.2	5.304	19.55
8	85.9	80.5	7.071	26.62

MIN. COMP. = 60 DB
MAX. COMP. = 99 DB
ARITHMETIC MEAN = 70 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

(64)

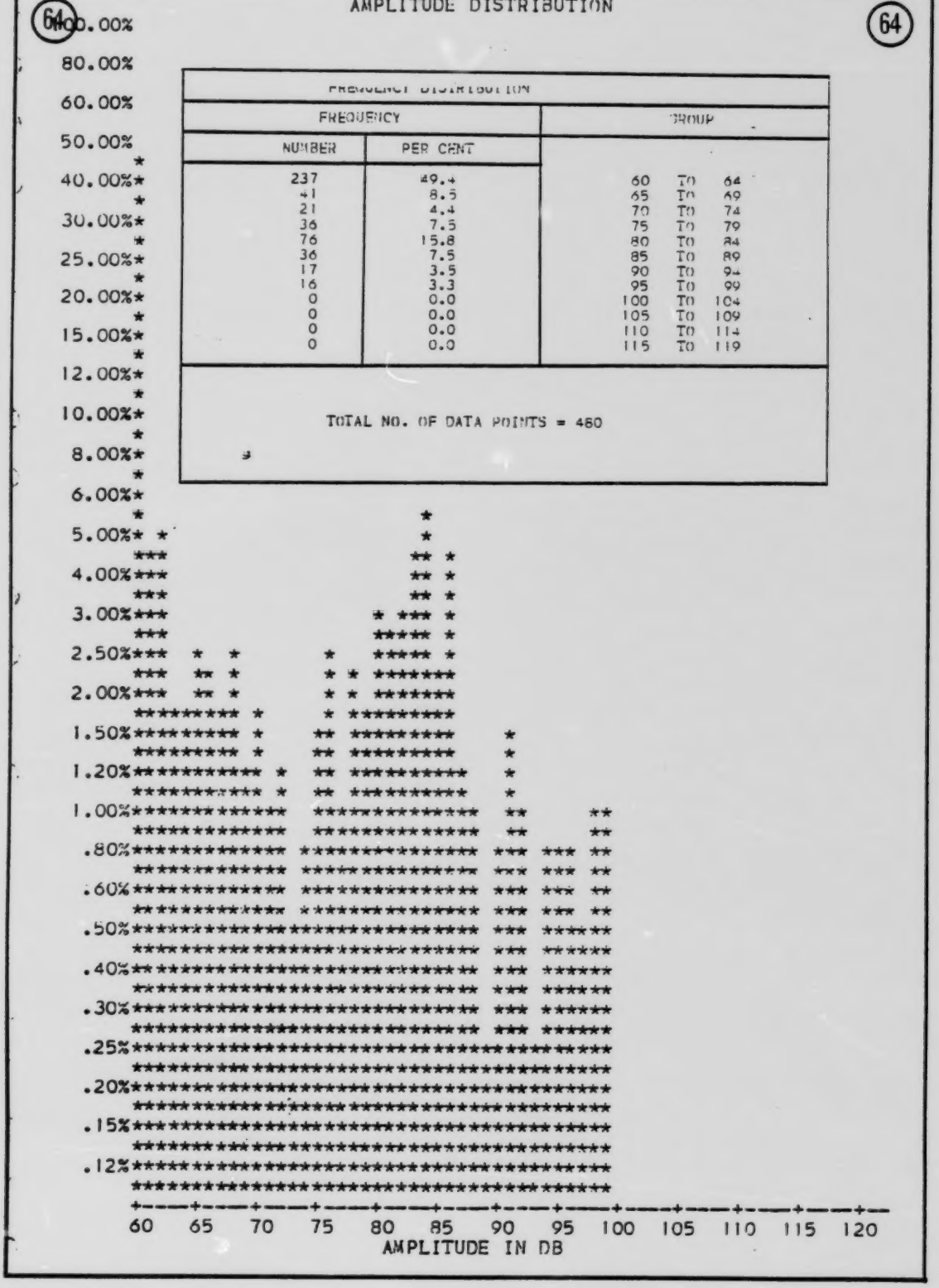
AMPLITUDE DISTRIBUTION

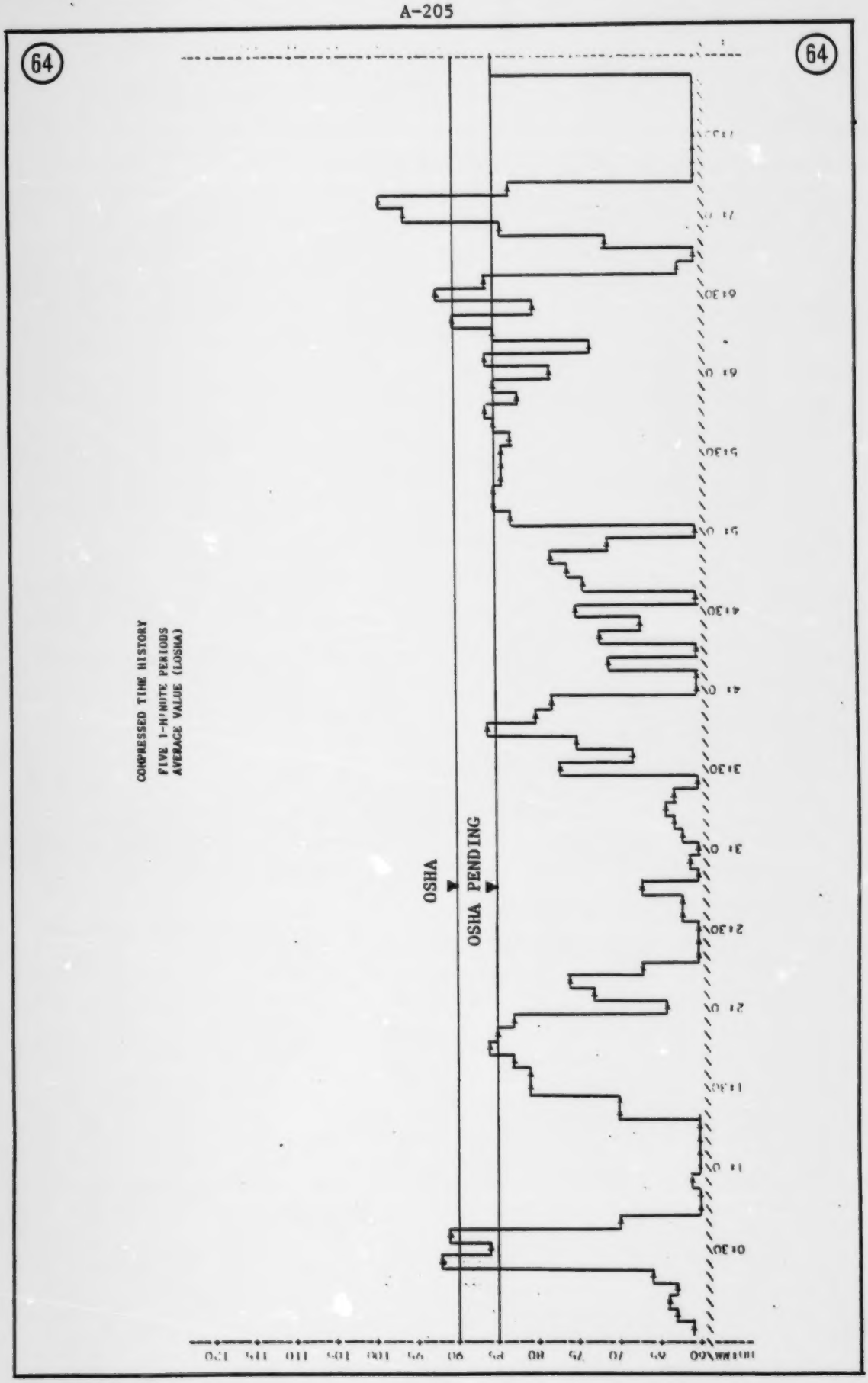
64 64

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
237	49.4	60 TO 64
41	8.5	65 TO 69
21	4.4	70 TO 74
36	7.5	75 TO 79
76	15.8	80 TO 84
36	7.5	85 TO 89
17	3.5	90 TO 94
16	3.3	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




64
64
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
0:00

65

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1224    60    64     4     1
     81     115200   480
  62  61  60  68  60  60  67  67  60  64  60  65  69  61  68  83
  85  86  91  83  82  86  72  85  68  84  89  85  95  95  92  97
  97  97  97  77  82  62  60  60  68  60  74  63  60  60  60  61
  61  62  73  77  60  60  60  60  60  60  61  60  60  61  60  60
  60  60  60  61  67  60  60  71  74  68  60  63  60  60  64  60
  60  60  60  60  60  60  65  60  60  60  60  64  62  60  61  60
  61  68  78  86  79  70  63  77  79  84  92  90  83  69  62  82
  83  63  79  81  82  81  81  79  72  69  85  92  89  91  65  74
  83  62  61  60  60  60  60  60  60  60  68  60  60  60  60  60
  70  63  63  69  74  63  60  60  60  63  61  75  80  82  83  80
  79  81  80  83  82  78  76  82  80  78  86  87  86  86  81  78
  84  73  64  67  76  75  78  67  77  86  78  63  60  80  88  93
  90  90  83  76  86  71  76  72  77  66  98  86  76  77  60  82
  66  85  81  82  83  82  68  69  77  87  89  89  84  89  84  75
  81  78  74  85  92  69  85  84  88  89  97  95  98  79  62  77
  66  69  81  75  84  71  76  72  81  75  74  72  76  71  80  75
  67  79  75  73  75  76  72  71  75  70  69  79  78  79  82  82
  71  60  60  60  60  61  63  62  60  60  60  64  60  60  60  60
  60  60  60  60  60  62  75  70  72  80  60  60  60  60  77  60  76
  83  80  74  77  74  71  60  64  63  63  72  69  71  73  62  74
  75  67  66  61  71  63  62  70  64  60  67  69  60  60  73  60
  60  77  79  75  81  82  80  81  79  85  82  83  79  82  86  90
  88  76  88  66  78  60  60  75  61  60  68  94  97  73  81  72
  60  68  62  66  60  67  69  67  60  67  72  70  79  77  81  79
  77  66  74  72  74  77  73  75  73  75  74  74  74  67  74  61
  63  79  83  85  85  78  80  81  75  87  85  80  60  70  63  69
  70  70  67  70  73  72  63  75  65  72  60  67  82  65  81  84
  84  75  61  78  73  72  75  77  86  83  73  83  79  77  82  79
  76  73  72  79  75  75  73  65  66  72  71  63  73  81  60  60
  60  66  64  74  79  60  60  60  77  86  68  66  70  70  75  87
%EOF
```

65

```
ENTER LOG DATE (DD/MM/YR) : 30/07/79

ENTER SITE CODE (5 CHARS) : 98013
ENTER USER CODE (4 CHARS) : 4769
 ENTER JOB CODE (3 CHARS) : 272
```

```
   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 98013
SERIAL NUMBER : 1224                       JOB CODE : 272
     BASELINE : 60 DB                     USER CODE : 4769
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC             TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0           STANDBY TIME =   0: 0:20
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

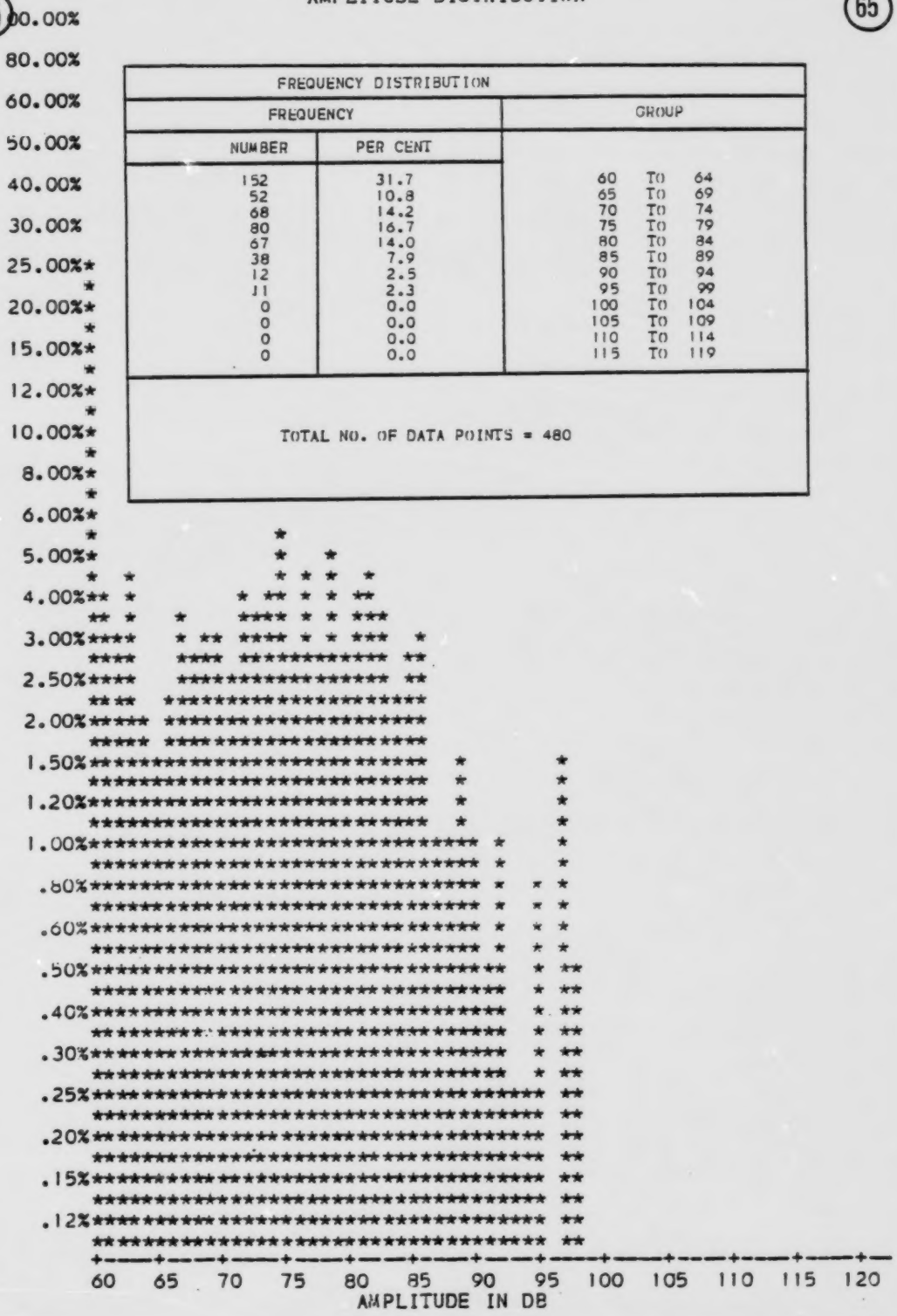
TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	83.3	83.3	4.970	4.97
2	75.4	80.4	1.648	6.62
3	78.7	79.9	2.606	9.22
4	85.4	81.7	6.641	15.87
5	73.2	80.6	1.217	17.08
6	77.0	80.1	2.061	19.14
7	78.5	79.9	2.532	21.67
8	76.2	79.6	1.854	23.53

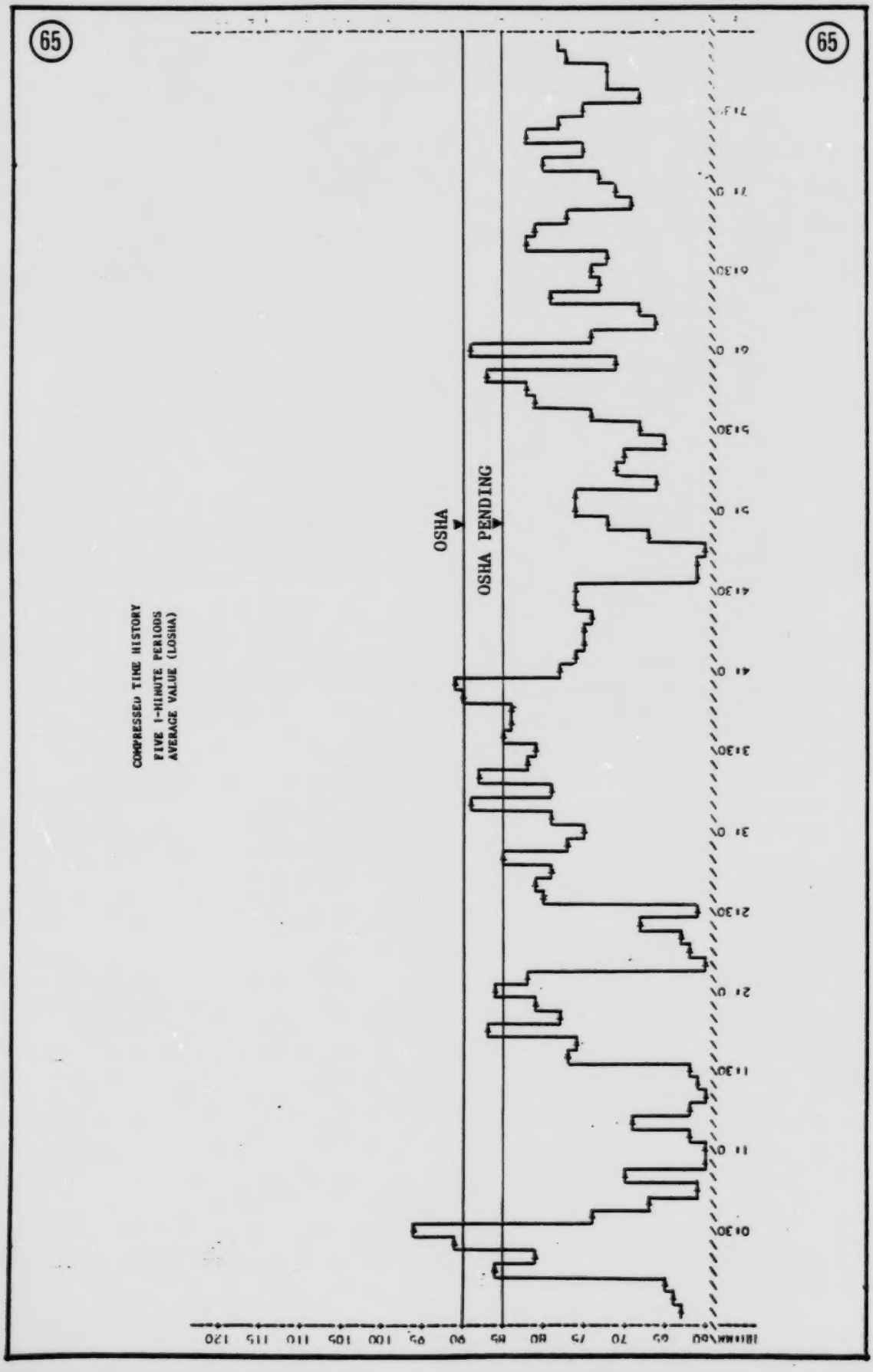
MIN. COMP. = 60 DB MAX. COMP. = 98 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 10 DB
VARIANCE =100 DB

65 AMPLITUDE DISTRIBUTION 65

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
152	31.7	60 TO 64
52	10.8	65 TO 69
68	14.2	70 TO 74
80	16.7	75 TO 79
67	14.0	80 TO 84
38	7.9	85 TO 89
12	2.5	90 TO 94
11	2.3	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




65
65
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
dBA
60
65
70
75
80
85
90
95
100
105
110
115
120
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(66)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225    60    64     4     1
     670     115200   480
  72  67  60  68  60  64  68  73  77  74  68  73  69  69  60  71
  86  81  88  87  82  80  72  80  82  74  87  86  91  93  95  90
  95  92  97  90  70  77  60  60  60  65  60  60  60  60  60  60
  61  60  60  60  60  60  61  60  60  60  71  60  64  60  60  60
  60  60  60  60  60  60  60  60  60  62  60  60  60  60  60  60
  60  60  60  60  62  67  60  60  61  69  68  73  65  60  79  66
  77  60  70  70  88  76  78  75  82  83  116 118 116 72  72  67
 108  79  78  83  82  82  83  82  82  82  82  117 116 118 94  63
 101  61  60  60  60  61  62  60  61  64  60  63  60  69  79  74
  64  60  60  60  60  60  60  60  60  60  61  61  75  78  65  61
  69  60  60  65  67  68  74  73  84  84  86  65  64  63  60  60
  66  61  60  60  60  60  60  64  60  77  94  72  80  82  110 119
 120 105 117 81  104 88  84  85  82  83  112 116 83  106 82  83
  71  79  60  60  76  76  88  78  85  110 120 119 110 117 115 89
  89  85  84  84  113 101 105 113 110 116 116 113 119 95  72  62
  60  68  75  72  64  68  63  67  68  73  67  69  63  62  64  66
  61  69  70  60  60  68  65  62  71  61  60  60  61  61  61  68
  62  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  63  61  73  69  73  79  69  72  84
 106  96  72  60  60  64  60  60  60  61  62  60  62  60  60  60
  60  63  62  60  60  60  70  79  63  67  64  60  72  75  80  83
  80  86  82  83  102 86  85  86  84  90  89  86  90  96  97  116
 120 105 113 70  92  77  68  92  82  81  83  117 109 60  60  60
  62  79  68  76  68  77  71  70  73  71  72  67  75  76  67  70
  71  78  78  74  71  77  74  73  64  65  69  61  60  60  63  60
  72  74  77  78  79  77  80  80  76  78  78  80  60  60  60  60
  60  60  60  60  69  60  60  66  67  66  66  73  82  88  91  117
 120  84  87  90  90  94  83  110 76  81  68  72  63  61  66  74
  73  67  77  65  71  71  62  64  64  62  60  60  63  77  62  60
  60  60  61  68  80  60  60  60  71  86  70  65  66  70  67  86
$EOF
```

(66)

```
ENTER LOG DATE (DD/MM/YR) : 30/07/79
ENTER SITE CODE (5 CHARS) : 98013
ENTER USER CODE (4 CHARS) : 4686
 ENTER JOB CODE (3 CHARS) : 272
```

```
   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 98013
SERIAL NUMBER : 1225                        JOB CODE : 272
      BASELINE : 60 DB                    USER CODE : 4686
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 2:47
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	81.8	81.8	3.983	3.98
2	96.1	92.0	29.112	33.09
3	96.0	93.6	28.761	61.86
4	108.1	100.6	154.570	216.43
5	65.1	99.0	.394	216.82
6	97.4	98.7	34.816	251.64
7	90.3	98.0	12.950	264.59
8	95.8	97.7	27.797	292.38

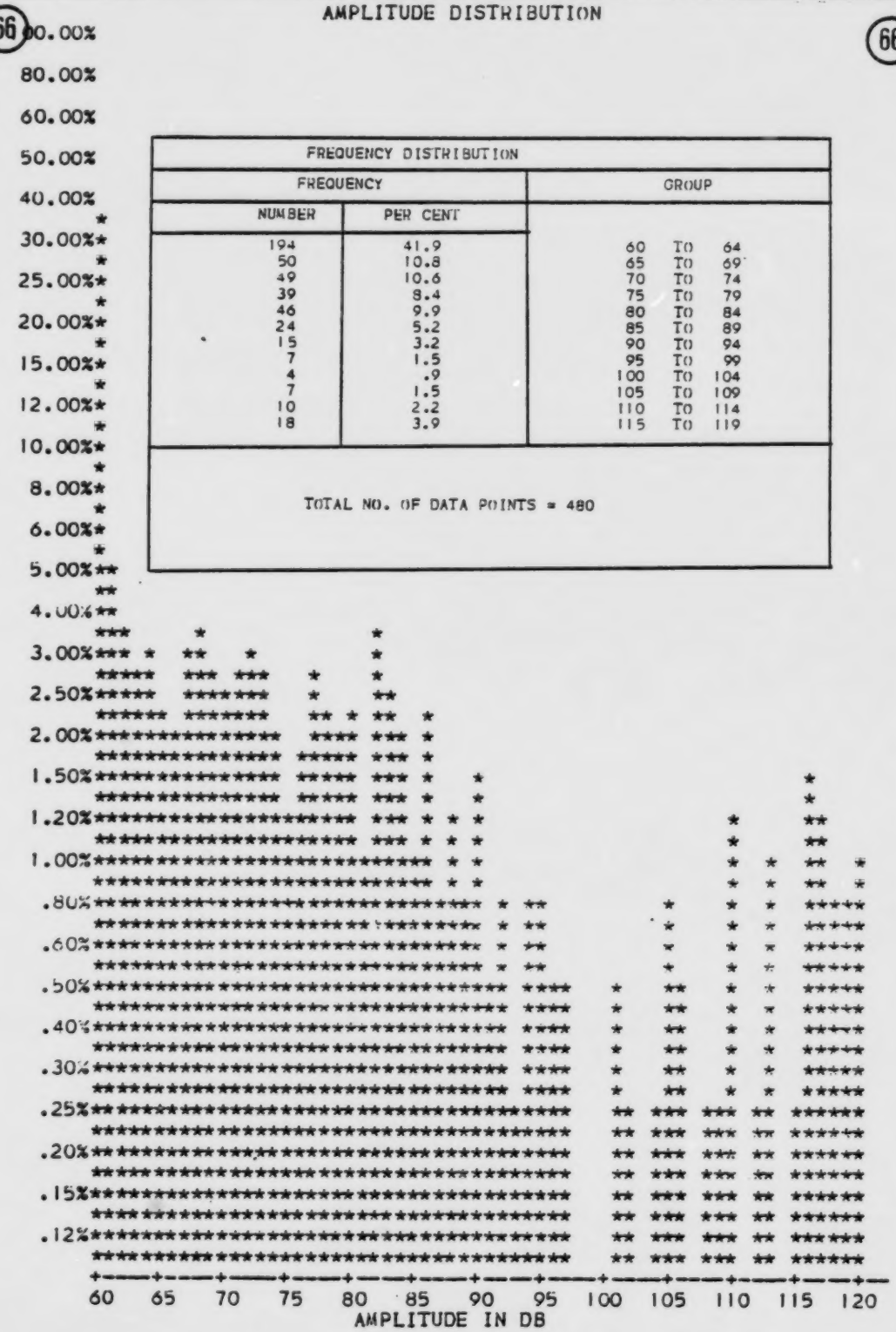
```
MIN. COMP. =  60 DB                MAX. COMP. = 120 DB
ARITHMETIC MEAN =  73 DB
STD. DEVIATION =  16 DB
VARIANCE =256 DB
```

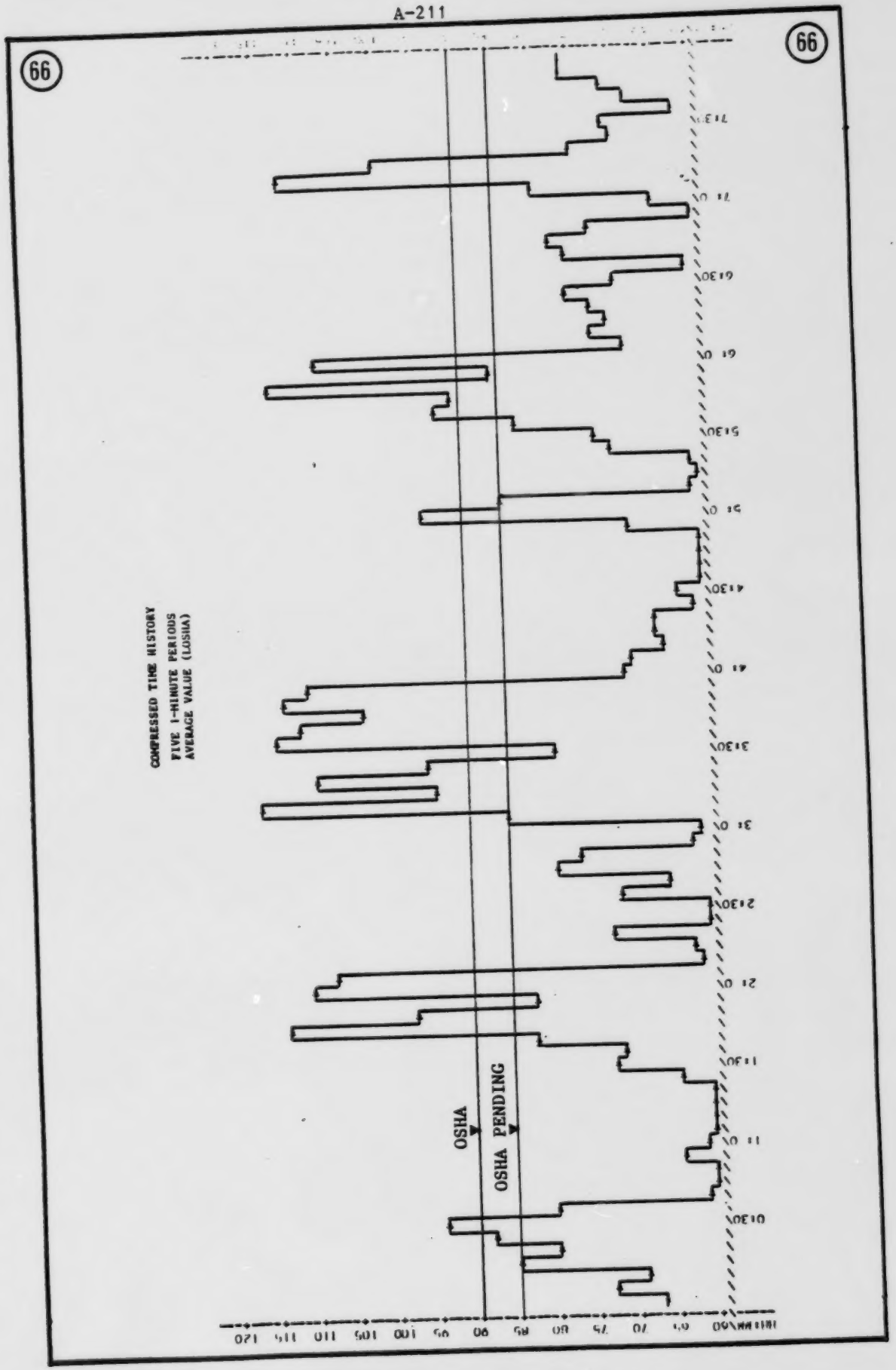
AMPLITUDE DISTRIBUTION

66 66

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
194	41.9	60 To 64
50	10.8	65 To 69
49	10.6	70 To 74
39	8.4	75 To 79
46	9.9	80 To 84
24	5.2	85 To 89
15	3.2	90 To 94
7	1.5	95 To 99
4	.9	100 To 104
7	1.5	105 To 109
10	2.2	110 To 114
18	3.9	115 To 119

TOTAL NO. OF DATA POINTS = 480




66
66
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
DB(A)/60
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(67)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1220    60    64     4     1
       79     115200   480
  60  60  60  60  60  62  60  60  60  60  61  62  60  60  60  61
  60  61  62  66  66  64  67  64  60  73  60  60  60  60  64  64
  60  60  61  67  62  69  88  93  93  88  86  76  72  60  76  60
  60  60  60  60  60  60  60  60  60  60  60  60  61  61  60  60
  60  60  60  60  60  61  60  61  64  60  60  60  60  62  60  60
  60  60  60  60  60  60  60  60  62  72  82  82  80  80  81  82
  82  87  85  84  84  84  84  83  84  84  85  80  81  81  81  85
  92  91  83  83  83  82  83  83  82  83  84  60  60  61  74  65
  74  76  67  66  61  60  66  64  62  60  60  60  69  60  64  61
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  65  60  60  62  60  62  61  69  69
  62  75  82  74  69  90  92  94  97  98  88  99  93  87  80  80
  81  75  60  60  60  60  60  60  60  60  60  61  60  60  60  60
  69  82  60  61  62  60  60  84  73  66  61  60  60  79  60  60
  60  60  78  60  82  82  60  78  70  62  72  64  64  62  62  60
  61  69  83  84  83  83  83  84  84  82  82  82  82  82  82  82
  82  92  82  82  82  83  83  81  81  93  95  94  94  94  94  83
  80  80  80  80  80  80  81  80  80  80  80  80  81  81  81  81
  81  81  80  79  80  80  81  81  80  73  60  60  60  60  60  60
  74  79  78  75  60  60  60  60  82  74  60  60  60  60  60  70
  83  81  75  84  87  81  81  75  61  60  60  60  68  74  74  70
  84  87  88  79  75  77  81  71  75  76  72  79  86  87  93  88
  73  70  75  60  60  60  60  60  60  60  60  61  60  60  60  60
  60  60  62  73  60  79  72  60  71  60  75  80  60  60  73  60
  80  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  63  60  62  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  65  60
%EOF


ENTER LOG DATE (DD/MM/YR) : 21/08/79
ENTER SITE CODE (5 CHARS) : 98013
ENTER USER CODE (4 CHARS) : 4761

 ENTER JOB CODE (3 CHARS) : 272


   DATA LOGGED :21  AUG 1979          DATA ANALYZED : 25 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 98013
SERIAL NUMBER : 1220                       JOB CODE : 272
      BASELINE : 60 DB                    USER CODE : 4761
 DYN RG RANGE : 94 DB                     THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                  TOTAL SAMPLES =  115200
TEST DURATION =   8 HR 0                  STARTAY TIME =   8 HR
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90.0 / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CRITERION) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

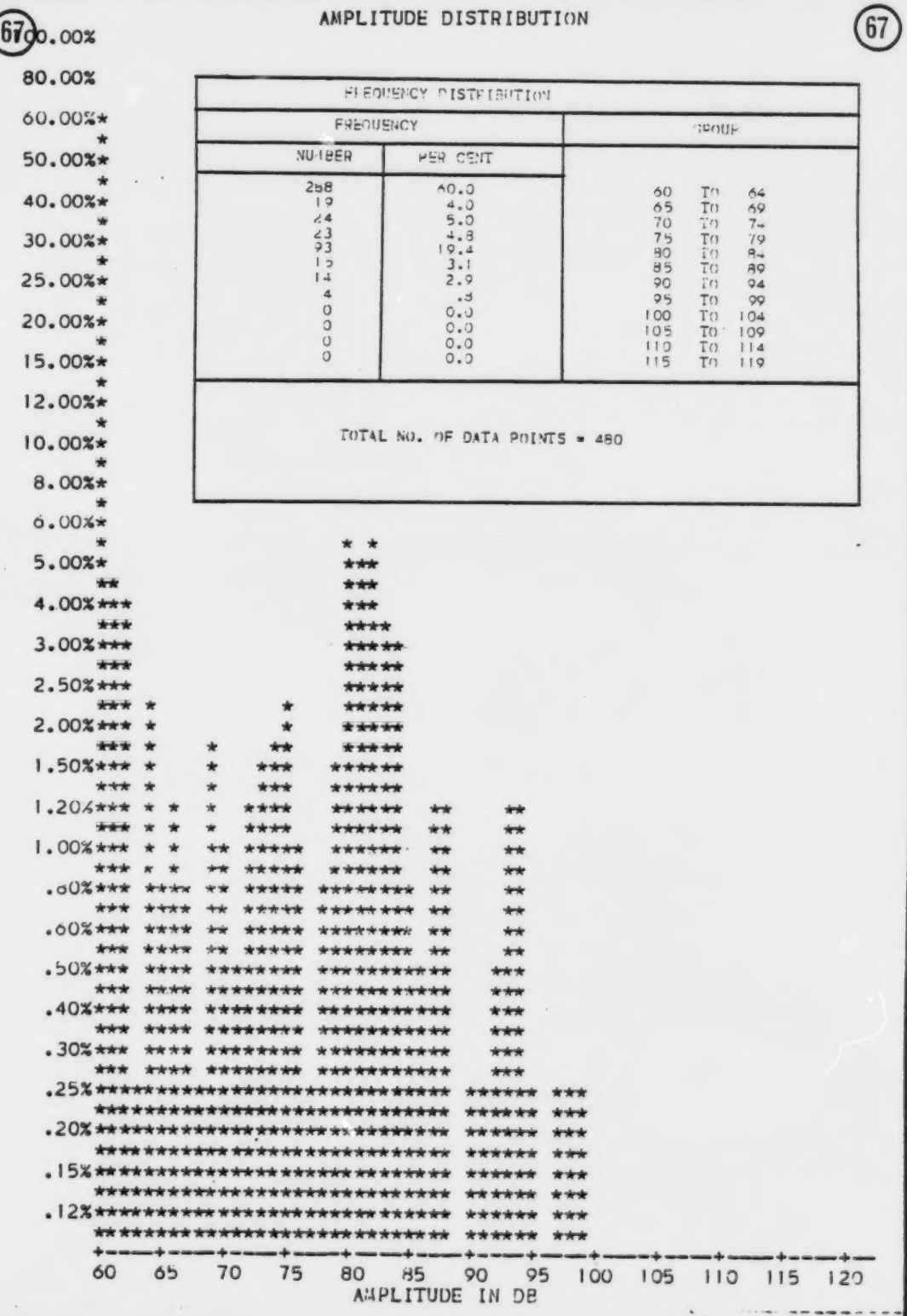
TIME          LOGA                    DOSE
HOUR     CURRENT   CUMULATIVE     CURRENT   CUMULATIVE
   1       74.1        74.1        1.373        1.37
   2       79.3        77.2        2.839        4.21
   3       67.1        75.1         .522        4.73
   4       81.3        77.2        3.766        8.50
   5       74.7        76.8        1.506       10.01
   6       83.0        78.3        4.709       14.72
   7       77.8        79.2        2.289       17.00
   8       65.3        77.4         .406       17.41
MIN. COMP. =  60 DB                MAX. COMP. =  99 DB
ARITHMETIC MEAN =  68 DB
STD. DEVIATION =  11 DB
VARIANCE =121 DB
```

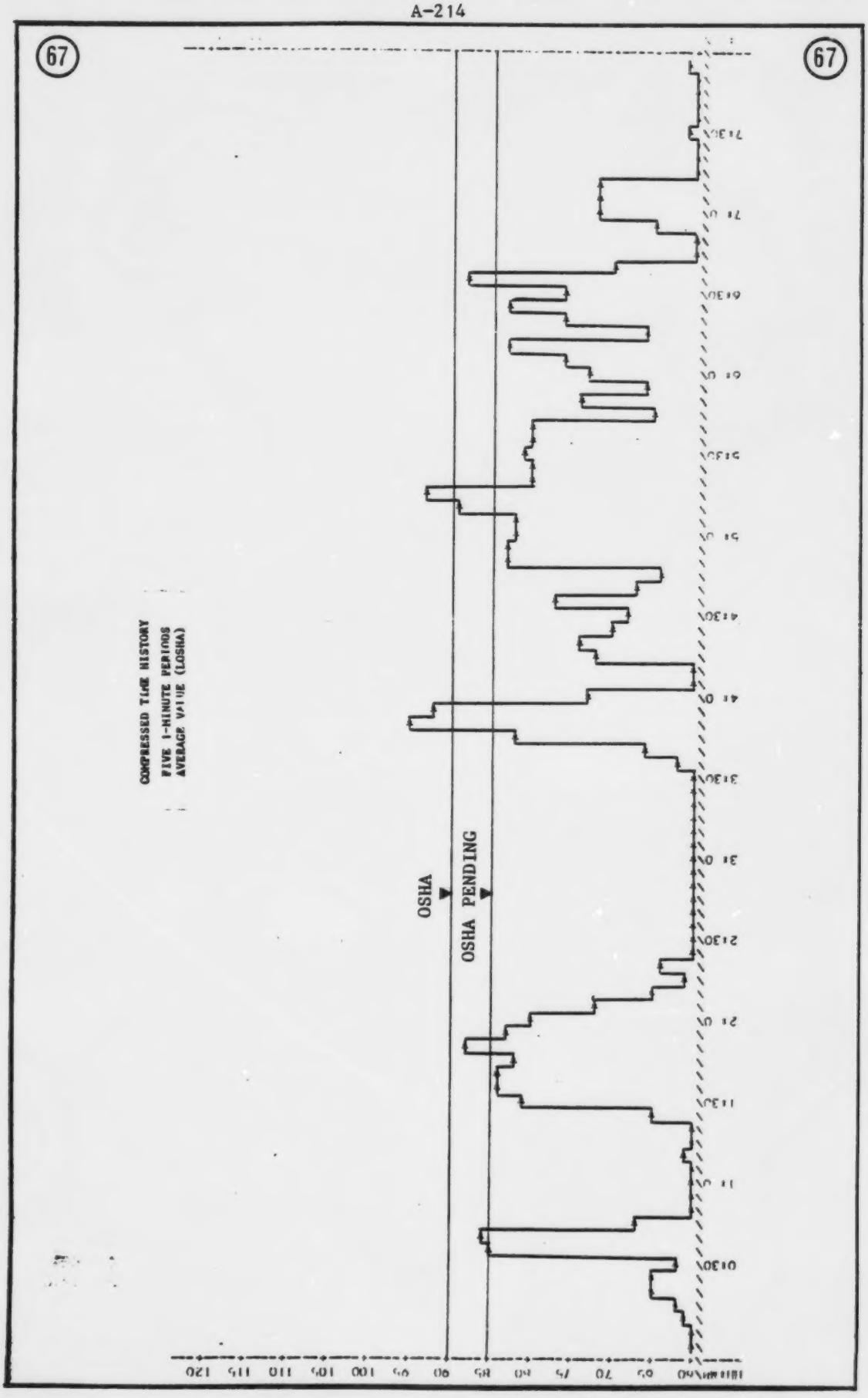
(67)

AMPLITUDE DISTRIBUTION

(67) (67)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
288	60.0	60 TO 64
19	4.0	65 TO 69
24	5.0	70 TO 74
23	4.8	75 TO 79
93	19.4	80 TO 84
15	3.1	85 TO 89
14	2.9	90 TO 94
4	.8	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




67
67
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
01:30
11 O'
11:30
21 O'
21:30
31 O'
31:30
41 O'
41:30
51 O'
51:30
61 O'
61:30
71 O'
71:30

68

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1218    60    64     4     1
    1708     115200  480
  60  60  65  60  60  61  60  60  65  65  66  64  67  64  67  63
  69  63  67  66  63  60  60  61  62  61  71  65  67  78  83  85
  78  77  70  61  60  60  61  60  60  60  60  60  60  60  60  60
  60  63  60  60  60  60  62  62  61  61  60  68  63  66  63  68
  64  60  65  66  68  75  66  68  70  66  60  67  64  63  68  64
  88  90  90  91  94  95  93  95  95  93  94  93  95  93  94  96
  67  93  87  93  83  67  64  66  62  71  69  60  69  73  62  66
  75  84 107 106 100  99 108 109 105 105  94  76  60  73  67  62
  65  66  82 100 109 112 111 110 110 108  97  88  92 105 103 109
 110 112 109 105 100  97 104  96  93 100  88  97  95  96  97  97
  99  99 104 104 106 107 105  88  88 102 109 110 105 107 106 107
 104  90  85  82  88 100  91  68  76  81  60  85  91  97  87  97
  98  98  97  96  95  95  96  94  88  87  85  87  86  88  87  91
  89  93  91  97  98  98  97  97  95  96  99 101  97  97  95  90
  87  87  86  94  87  87  86  85  86  86  86  85  85  85  96  85
  85  85  86  85  86  85  85  85  85  85  85  86  85  86  86  86
  86  88  86  86  86  85  85  85  86  86  86  86  85  85  87  87
  86  86  86  86  86  86  86  90  93  93  92  87  87  87  88  87
  88  85  91  88  87  86  85  85  86  85  85  85  89  90  84  88
  91  85  92  85  84  87  88  87  87  88  88  88  90  88  86  77
  60  82  66  60  60  60  60  60  60  60  60  60  60  63  60  60
  60  60  60  60  62  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  64  70  69  60  60  62
  69  73  71  71  72  77  78  83  94  74  85  84  85  86  77  80
  84  74  75  81  88  82  83  79  84  86  93  92  91  93  91  91
  91  85  92  92  91  90  87  88  88  89  88  81  85  88  89  90
  88  88  88  86  90  80  91  90  89  89  88  89  84  92  91  91
  89  88  90  90  89  89  89  88  88  86  88  90  90  90  89  89
  90  88  82  92  88  90  90  89  90  90  87  88  77  72  69  76
  69  69  65  60  76  72  71  69  74  77  74  83  74  73  69  69
%EOF
```

68

```
ENTER LOG DATE (DD/MM/YR) : 14/09/79.
ENTER SITE CODE (5 CHARS) : 42953
ENTER USER CODE (4 CHARS) : 4687
 ENTER JOB CODE (3 CHARS) : 271
```

```
   DATA LOGGED :14 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
       LOGGER : DB-301/24                 SITE CODE : 42953
SERIAL NUMBER : 1218                       JOB CODE : 271
     BASELINE : 60 DB                      USER CODE : 4687
DYNAMIC RANGE : 64 DB                      THRESHOLD : 80 DB
SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  1152 (0
TEST DURATION =    0: 0: 0          STARTED AT =    : 7: 7
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOW LEVEL = 60 DB / 0 DB
REACTION (DOSE) LEVEL = 0 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOGIA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	67.8	67.8	.572	.57
2	92.0	87.8	17.924	18.50
3	103.5	97.0	80.754	99.25
4	92.5	96.1	17.762	117.01
5	86.7	95.0	7.847	124.90
6	80.3	93.9	3.267	128.17
7	85.5	93.1	6.720	134.[illegible]
8	86.5	92.6	7.735	142.62

```
MIN. COMP. =  60 DB                MAX. COMP. = 112 DB
ARITHMETIC MEAN =  81 DB
STD. DEVIATION =  14 DB
VARIANCE =196 DB
```

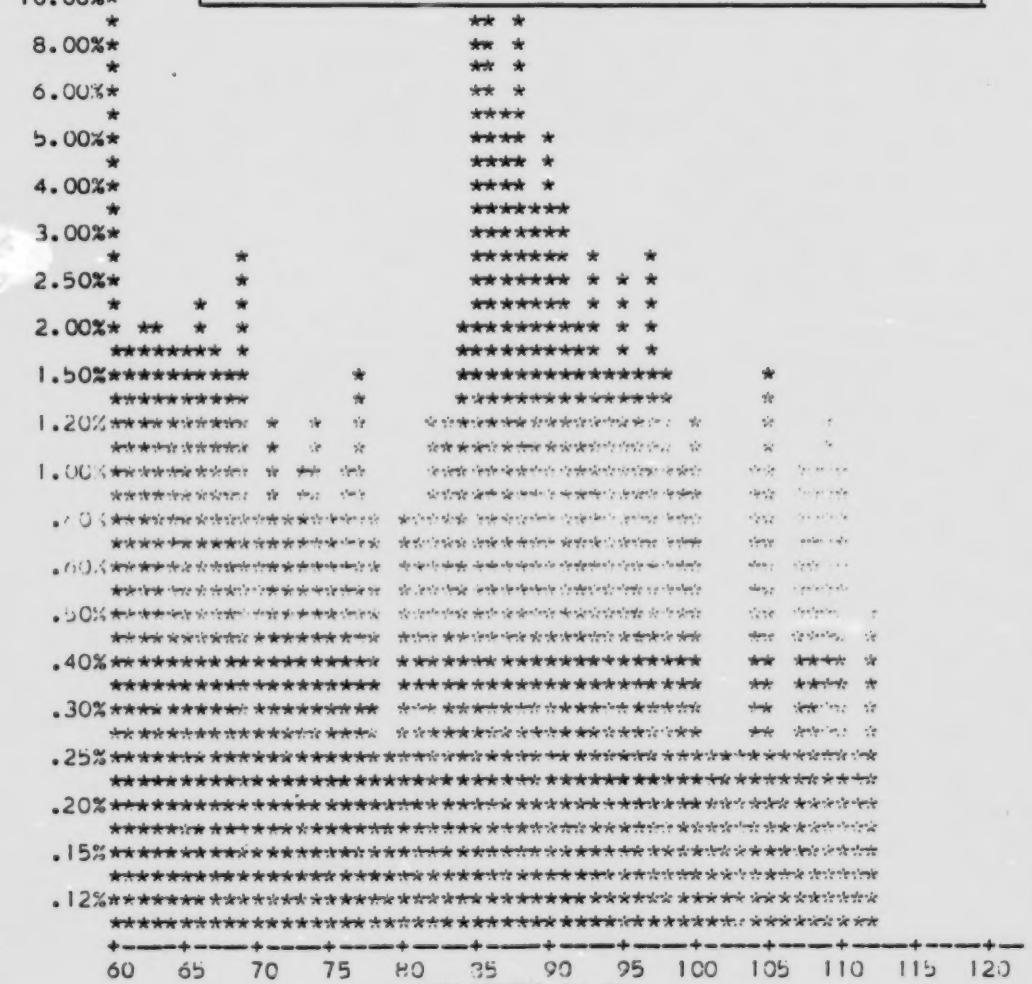
AMPLITUDE DISTRIBUTION

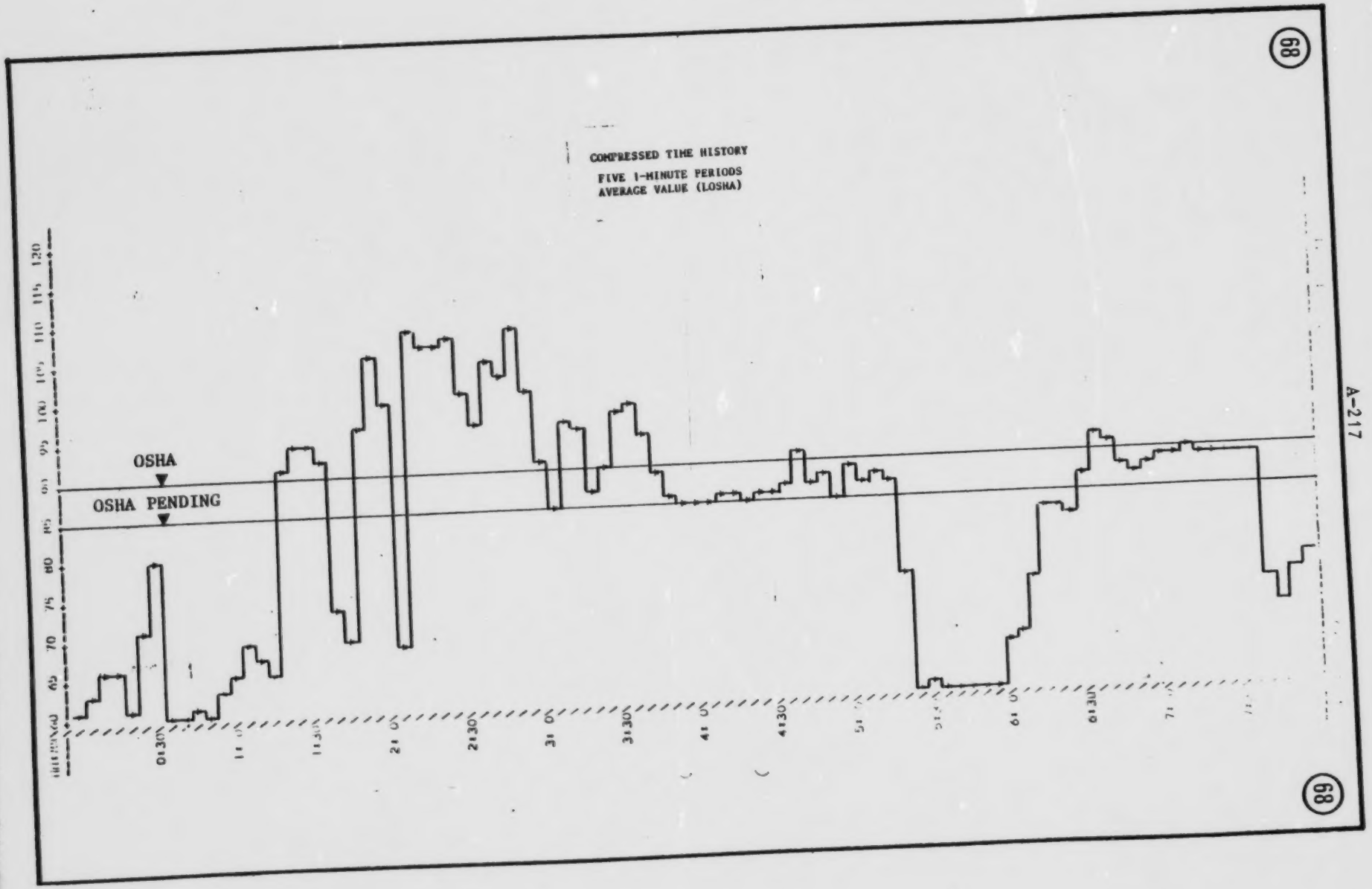
(68) (68)

FREQUENCY DISTRIBUTION

FREQUENCY		AMPLITUDE
NUMBER	PER CENT	
100	20.8	60 TO 64
40	8.3	65 TO 69
20	4.2	70 TO 74
17	3.5	75 TO 79
24	5.0	80 TO 84
142	29.6	85 TO 89
61	12.7	90 TO 94
37	7.7	95 TO 99
12	2.5	100 TO 104
20	4.2	105 TO 109
7	1.5	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
65
70
75
80
85
90
95
100
105
110
115
120
01:30
11:30
21:30
31:30
41:30
61:30
89
89

(69)

```
 1  20  80  1214   60   64    4    1
    82      115200  480
 60  60  60  60  60  63  62  60  64  60  60  64  66  67  60  60
 60  60  60  70  62  70  71  67  77  68  75  67  60  61  63  65
 64  60  62  60  63  60  60  60  71  60  60  62  62  60  60  61
 60  60  61  60  63  76  76  76  85  86  66  79  86  86  87  76
 80  87  83  60  74  60  60  75  76  76  76  75  79  82  80  82
 80  80  79  86  89  82  86  87  81  75  65  62  61  60  60  75
 61  70  68  80  77  87  88  86  88  86  84  80  86  85  86  88
 79  65  70  72  86  87  91  86  87  86  83  73  69  71  69  72
 87  86  86  87  85  83  84  87  96  97  87  84  84  85  83  78
 74  79  82  97 105 102 112 111 115 112 102  83  82  84  76  83
 86  84  84  84  83  83  84  84 112 111 113 111 110  86  85  93
100  96  96 103 114 107 115 113  98 100 112 112 113 115  96 109
107 116 110 115 104  97  88  99 106 115 112 113 112 106  85  88
101  91 113 113 116 113 100  87  86  85  86  93  92 100  95 112
113 114 114  89  93  97  97 113 111 115 113 111  85 101  85  82
 80  80  80  85  83  81  80  67  65  79  80  80  80  80  80  80
 80  80  80  77  62  62  73  77  81  80  82  88  82  80  80  78
 80  82  82  84  84  83  83  85  81  80 113 113 116 112 114 109
 84  90 100 104 117 113 116 107  84  98 115 112 118 113 109 112
117 115 120 106 102 117 115 112 117 101 116 115  79  97 107 114
114  99 112 111  89 113 115 114 110 116 114 114  87  87  87 114
107  95 113 115 115 116 116  84  84  83  85  85  84  88  86 101
117 111 113 114  87  86  85  85 101  99 107 105 113 115 117 115
107 115 114 117 114 109  90 117 115 118 111 108 100 113 118 114
114 101 118 112 115 113 106 117 118 114 104  87  83 101 105 118
116 108 116 110 108 118 117 115 113 103  84  84  86  86  84  84
 85  84  82  81  81  81  81  81  81  81  71  64  66  61  60  62
 64  60  83  67  61  60  60  60  62  60  60  60  60  60  65  63
 68  73  81  60  81  86  90  89  72  81  71  77  66  60  62  69
 66  77  76  60  60  60  60  60  60  60  60  70  60  60  60  64
%EOF
```

(69)

ENTER LOG DATE (DD/MM/YR) : 10/09

ENTER SITE CODE (5 CHARS) : LEAPO
ENTER USER CODE (4 CHARS) : 5543
ENTER JOB CODE (3 CHARS) : 270

DATA LOGGED :10 SEPT 1900
LOGGER : DB-301/26
SERIAL NUMBER : 1214
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8[illegible] 0

DATA ANALYZED : 27 SEPT 1979
SITE CODE : LEAPO
JOB CODE : 270
USER CODE : 5543
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = [illegible]

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CRITERION) LEVEL = 80 DB
NUMBER OF CONVERSIONS = 480
PERIOD = 1 MINUTES

TIME HOUR	LEQ(A) CURRENT	LEQ(A) CUMULATIVE	DOSE CURRENT	DOSE CUMULATIVE
1	89.1	89.1	.088	.09
2	86.2	78.3	4.241	4.93
3	100.2	92.9	51.108	56.13
4	108.[illegible]	103.8	147.941	223.07
5	102.0	101.2	71.317	294.98
6	111.0	104.0	230.141	525.12
7	111.6	105.7	248.339	773.46
8	74.0	104.8	1.481	775.94

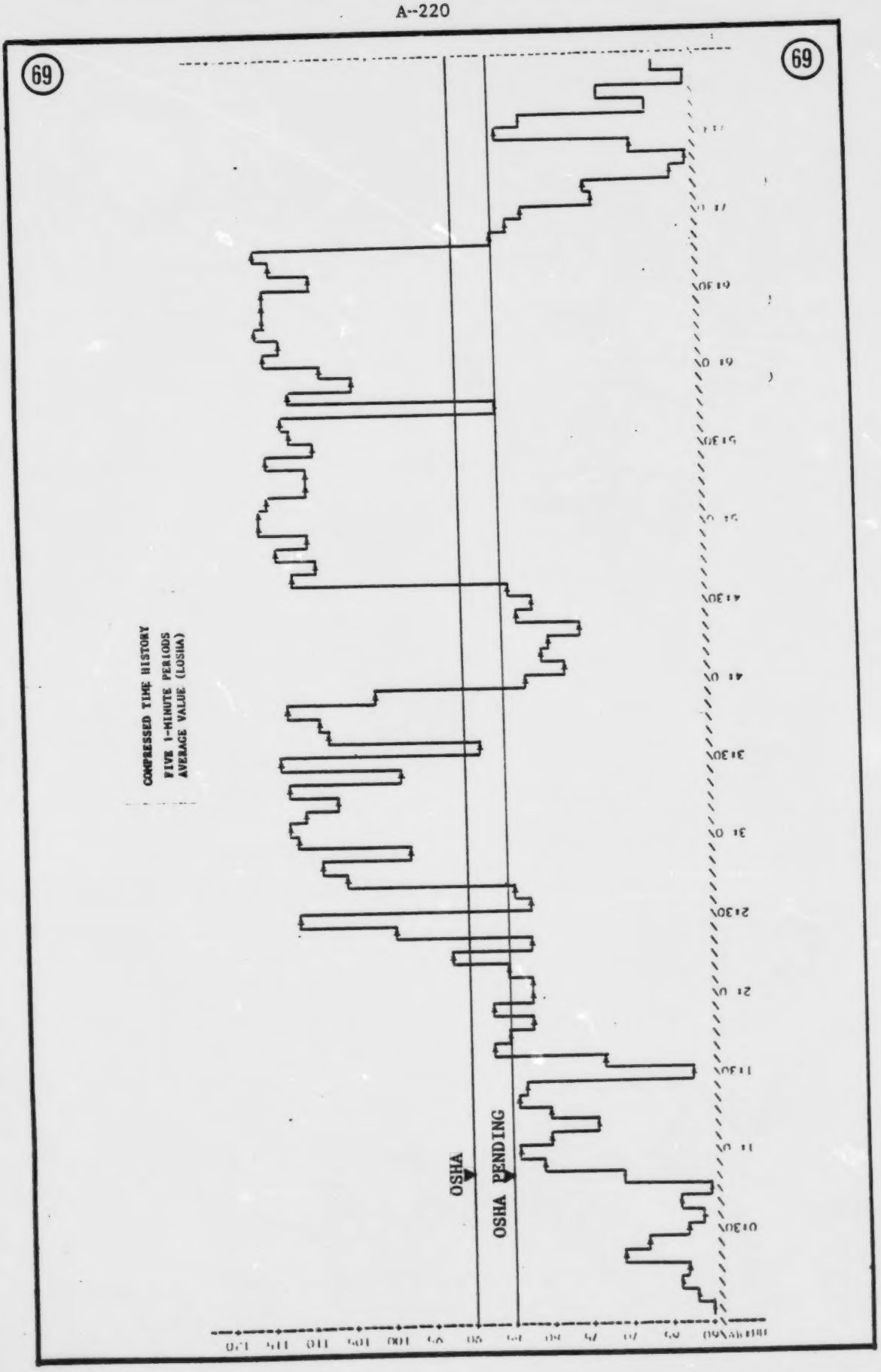
MIN. COMP. = 60 DB
ARITHMETIC MEAN = 87 DB
STD. DEVIATION = 12 DB
VARIANCE = 141 DB
MAX. COMP. = 120 DB

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
83	17.3	60 TO 64
21	4.4	65 TO 69
17	3.5	70 TO 74
29	6.1	75 TO 79
86	18.0	80 TO 84
68	14.2	85 TO 89
9	1.9	90 TO 94
15	3.1	95 TO 99
21	4.4	100 TO 104
21	4.4	105 TO 109
63	13.2	110 TO 114
46	9.6	115 TO 119

TOTAL NO. OF DATA POINTS = 480


69
69
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
11 00
11:30
21 00
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31 00
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9130
9140
9150
9160
9170
9180
9190
9200
9210
9220
9230
9240
9250
9260
9270
9280
9290
9300
9310
9320
9330
9340
9350
9360
9370
9380
9390
9400
9410
9420
9430
9440
9450
9460
9470
9480
9490
9500
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9520
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9680
9690
9700
9710
9720
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9840
9850
9860
9870
9880
9890
9900
9910
9920
9930
9940
9950
9960
9970
9980
9990
10000

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1218   60   64    4    1
    3984      115200   480
 60  63  71  80  77  73  77  81  77  79  78  75  72  73  81  78
 78  69  78  74  72  75  71  79  76  80  78  79  77  81  80  74
 80  82  90  94  89  68  83  74  70  60  61  83  78  69  82  84
 85  85  84  83  83  83  83  83  84  85  85  86  85  85  84  84
 84  84  84  84  84  84  84  84  84  84  84  85  91  94  95  92
 92  95  96  94  95  91  89  84  83  83  81  82  82  82  83  85
 96 101  98  85 111 110 111 109  97 105 114 112 111 111  86  97
 84  96 100  85  83  94 108 110 102 111 112 112 110 109  99  89
 88  83  83  81  82  82  82  81  82  82  82  85  85 103 113 108
113 110  99 113 110  84 110 112 109  98  84  82  85  92  88  86
 82  82  82  90  87  82  83  14  85  90  84  86  95 103  76  84
 94  95  97  92  96  94  94 103 109 110  96 113 106  99  90  98
112 112  86  87  96  97  91  93  91  95  92  97  84  78  83  89
 99  93  93  89  92  93  86  95  86  85  85  85  86  84  97  86
 86  98  82  84 102  86  86  86  86 101 100  86  88  81  84  84
 83  96  85  84  84  84  84  84  84  84  84  84  84  84  84  84
 84  84  84  84  84  84  84  83  84  84  85  86  86  85  85  85
 84  83  83  84  85  84  83  84  84  93  84  85  87  86  84  94
 91 109 110 108 110 107  94 109 109  94  83  87 104 104  86  96
 87  87 106 108 102 114 109 114 105  83  96 108 114 112 110  98
 92 107 115 113 111  92  92 114 115 113 111  96 111 115 113 114
 98 111 114 112 113  96 113 113 112 105  86  84  86  92  71  67
 71  79  87  85  83  82  86  85  85  85  83  82  82  82  82  87
 85  82  81  79  78  83  81  82  82  81  92  83  84  84  83  82
 90  80  79  71  72  70  65  62  66  83  85  87  84  83  89 100
 98  99  90  80  75  83  85  88  82  82  81  85  86  84  89  89
 82  82  84  89  71  78  76  78  86  80  82  70  67  76  76  83
 82  81  86  78  87  81  74  81  70  60  74  77  68  74  76  74
 74  71  85  90  92  84  76  69  60  60  63  60  60  62  60  62
 60  60  60  60  60  60  60  60  60  60  60  61  60  60  60  60
%EOF


ENTER LOG DATE (DD/MM/YR) : 11/09/79.
ENTER SITE CODE (5 CHARS) : LEAPO

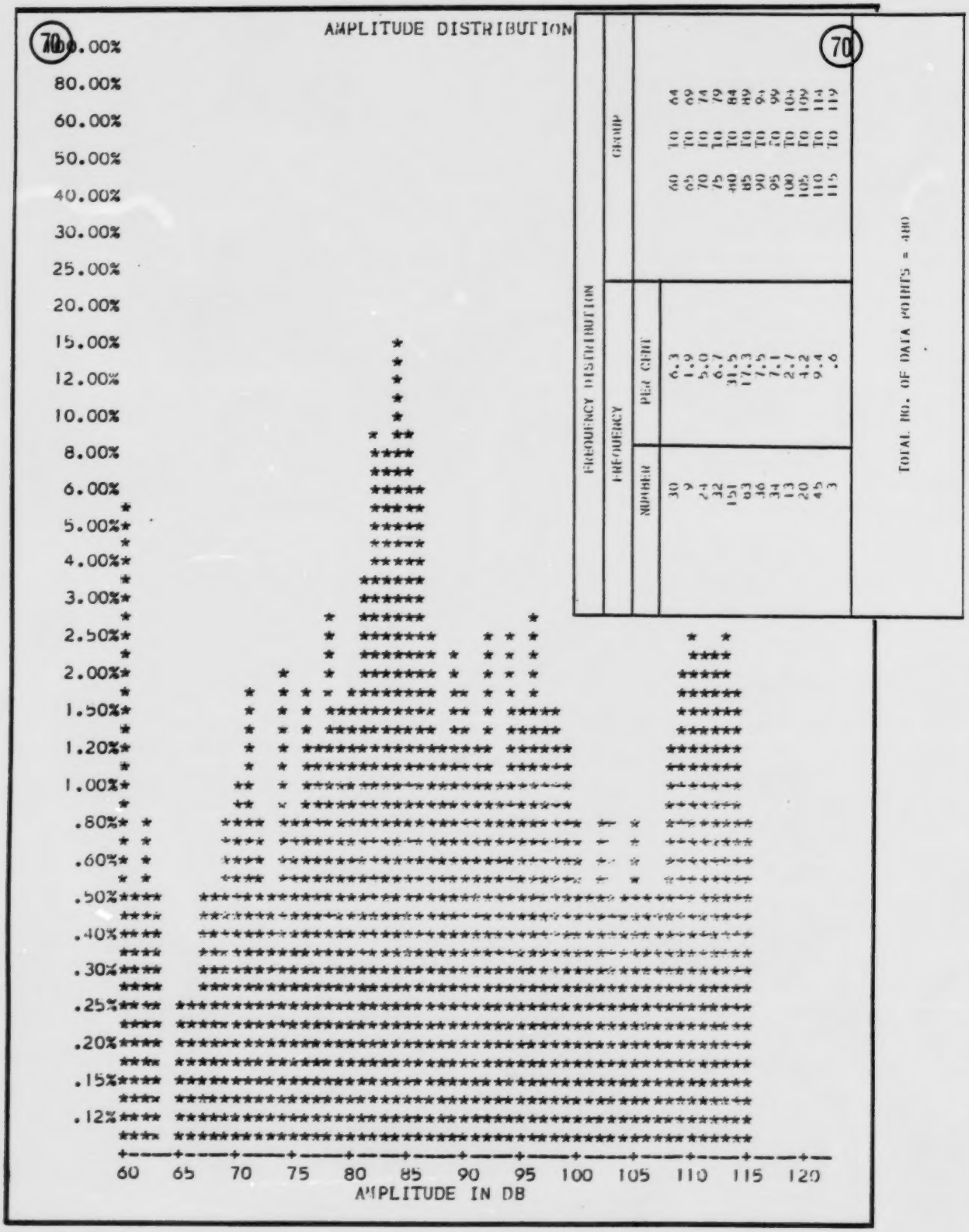
ENTER USER CODE (4 CHARS) : 8397
 ENTER JOB CODE (3 CHARS) : 271

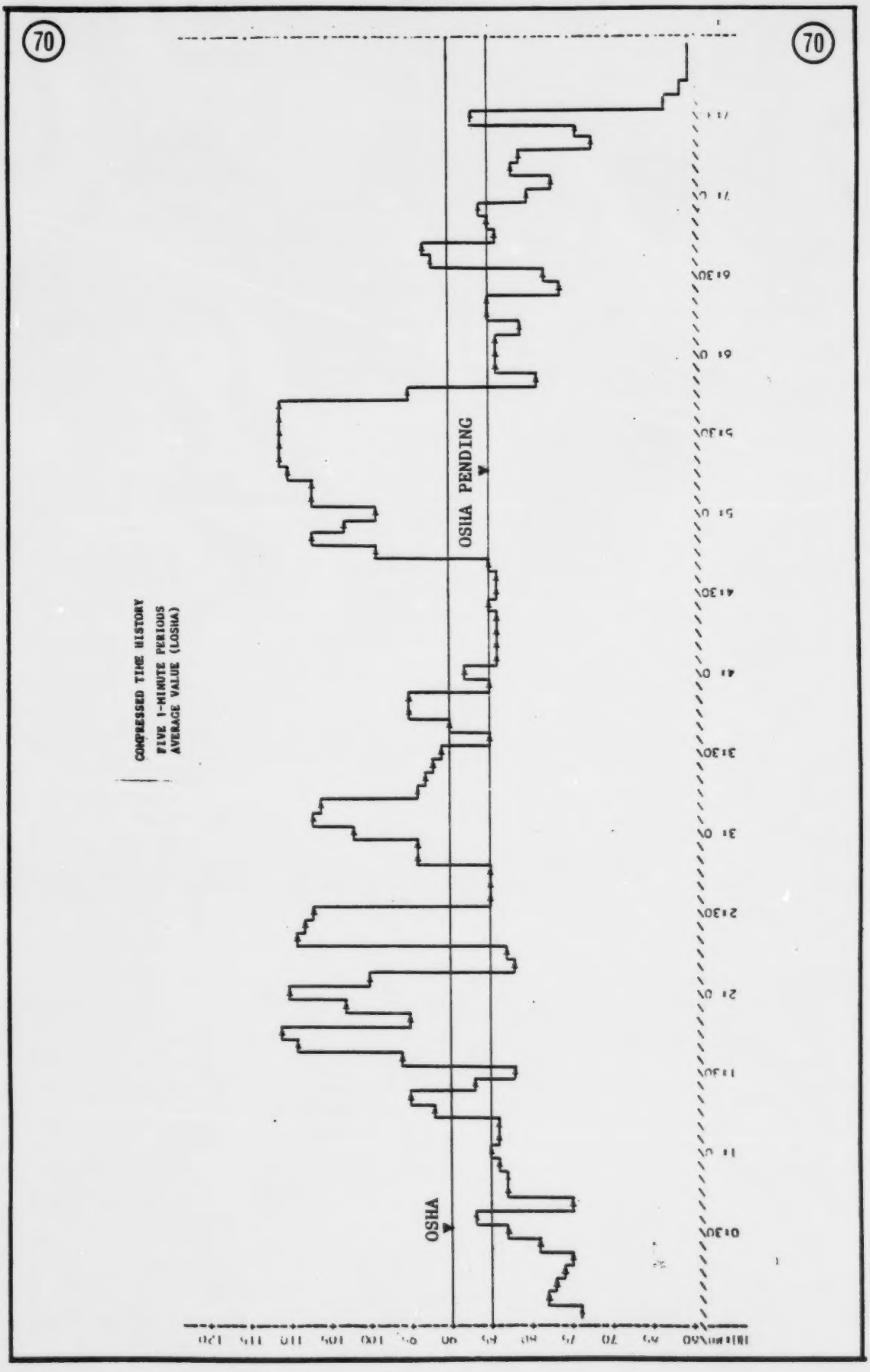

   DATA LOGGED :11 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : LEAPO
SERIAL NUMBER : 1218                      JOB CODE : 271
     BASELINE : 60 DB                     USER CODE : 8397
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                    TOTAL SAMPLES =  115200
TEST DURATION =  8 HRS 0                  STANDBY TIME =  0:10:36

            TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LEQ(A                          DOSE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1      80.7      80.7          3.434       3.43
   2     100.1      95.5         50.501      53.94
   3     101.8      98.3         64.472     118.41
   4      98.1      98.3         38.685     157.09
   5      95.4      97.8         26.449     183.54
   6     107.5     100.6        141.955     325.50
   7      86.0      99.6          7.179     332.67
   8      77.1      98.7          2.090     334.76
MIN. COMP. =  60 DB              MAX. COMP. = 115 DB
ARITHMETIC MEAN =  86 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```


AMPLITUDE DISTRIBUTION
70
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 30 6.3
65 TO 69 9 1.9
70 TO 74 24 5.0
75 TO 79 32 6.7
80 TO 84 151 31.5
85 TO 89 83 17.3
90 TO 94 36 7.5
95 TO 99 34 7.1
100 TO 104 13 2.7
105 TO 109 20 4.2
110 TO 114 45 9.4
115 TO 119 3 .6
TOTAL NO. OF DATA POINTS = 480


70
70
OSHA PENDING
OSHA
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(71)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1225   60   64    4    1
    216    115200  480
 61  60  60  60  60  60  60  60  60  60  61  60  60  63  60  70
 60  65  60  60  61  60  68  62  62  67  65  70  60  60  62  81
 83  82  82  95  86  86  88  85  85  87  84  87  97 101  93  97
 93  86  84  89  92  91  79  88  94  90  88  89  92  96  91  94
 66  75  72  64  64  70  67  68  60  60  58  61  62  59  71  62
 78  74  73  75  73  77  74  75  74  62  60  60  64  80  60  60
 60  61  60  60  60  60  70  85  76  60  61  81  78  78  76  64
 68  60  61  60  68  80  81  74  74  80  69  69  68  75  75  64
 60  75  85  61  61  63  77  81  60  60  63  60  60  62  60  60
 60  69  62  65  69  63  63  73  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  64  66  60  60  60  60  60  60  60  61
 60  60  60  60  60  60  60  76  69  60  60  72  71  77  77  73
 73  82  90  90  78  73  69  61  61  60  60  86  93  98  91  89
 95  96  95  86  80  71  60  72  81  82  65  66  83  91  92  92
 91  91  91  92  92  93  90  92  92  89  92  93  84  72  60  60
 68  60  85  90  90  91  88  89  93  91  92  90  84  72  93  86
 73  60  60  60  60  70  61  60  61  60  62  61  60  60  65  60
 60  61  60  63  60  62  60  61  60  60  64  66  65  60  61  65
 74  72  60  64  73  66  74  71  69  61  75  79  70  60  60  85
 71  60  60  60  82  74  79  72  71  67  63  82  64  60  60  60
 60  60  60  60  60  60  60  60  60  66  69  60  60  62  60  60
 60  60  60  62  63  81  80  73  60  72  73  60  60  60  60  60
 60  60  60  62  60  86  83  76  89  90  89  90  89  89  90  91
 90  90  92  93  90  84  60  61  62  60  60  60  60  60  60  60
 61  70  75  77  84  92  90  93  92  92  91  92  92  90  89  90
 90  90  89  91  90  90  89  85  80  79  66  78  64  60  60  62
 68  60  63  86  87  77  60  72  66  69  62  61  68  74  74  69
 75  68  73  73  72  74  62  65  72  84  89  90  86  70  60  67
 60  60  60  69  70  66  67  76  71  72  61  77  69  75  87  74
 62  60  78  85  73  60  60  60  60  60  60  85  91  97  79  87
%EOF
```

(71)

```
ENTER LOG DATE (DD/MM/YR) : 17/08/79
ENTER SITE CODE (5 CHARS) : ISHAF
ENTER USER CODE (4 CHARS) : 4793
 ENTER JOB CODE (3 CHARS) : 270
```

```
   DATA LOGGED :17  AUG 1979          DATA ANALYZED : 25 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : ISHAF
SERIAL NUMBER : 1225                       JOB CODE : 270
     BASELINE : 60 DB                     USER CODE : 4793
DYNAMIC RANGE : 64 DB                     THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:54
```

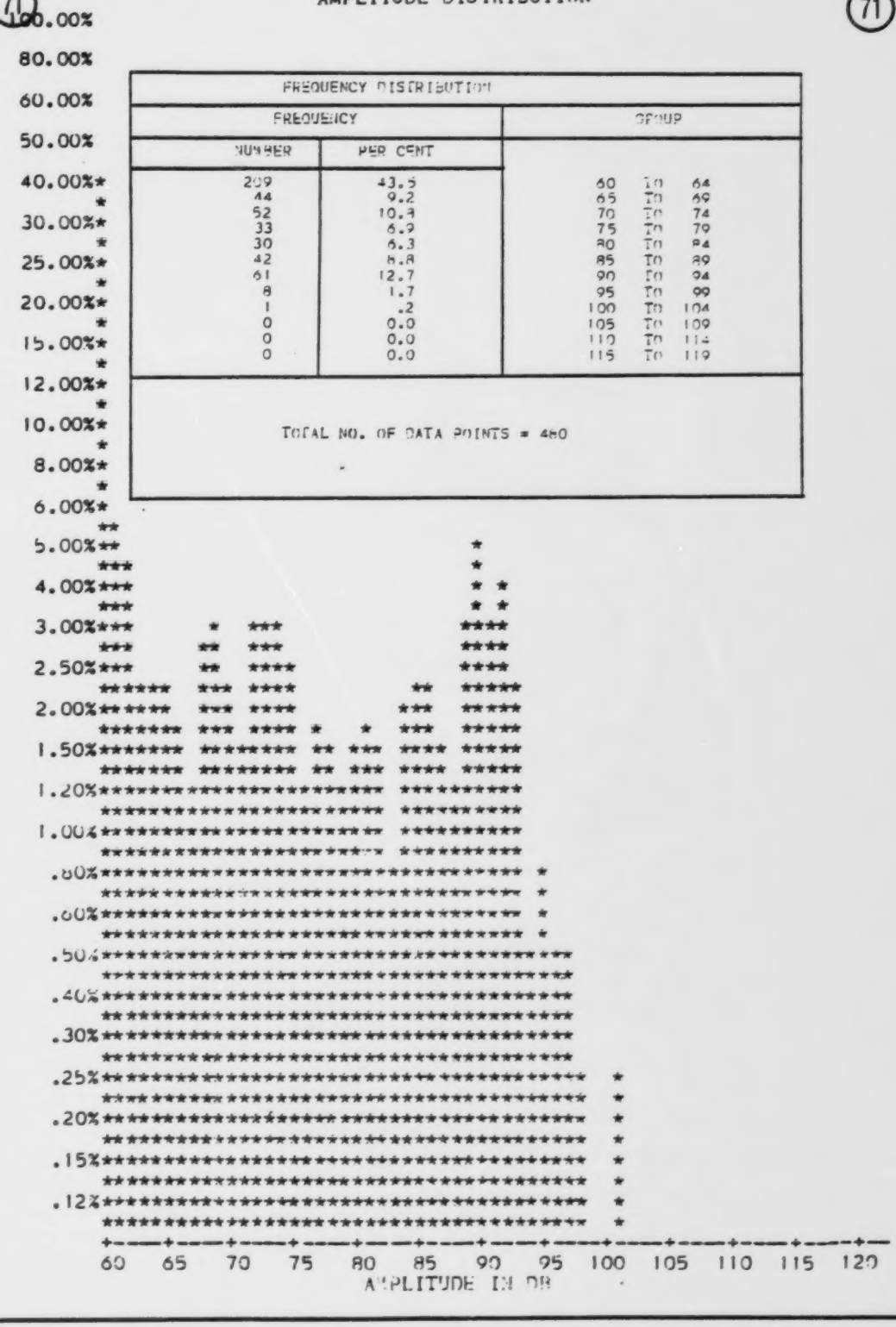
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.3	85.3	6.516	6.52
2	78.4	82.7	2.518	9.03
3	68.1	80.2	.598	9.63
4	86.9	82.5	8.099	17.73
5	79.8	82.1	3.048	20.78
6	71.3	81.1	.933	21.71
7	86.5	82.1	7.672	29.38
8	77.6	81.7	2.256	31.64

MIN. COMP. = 60 DB MAX. COMP. = 101 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB

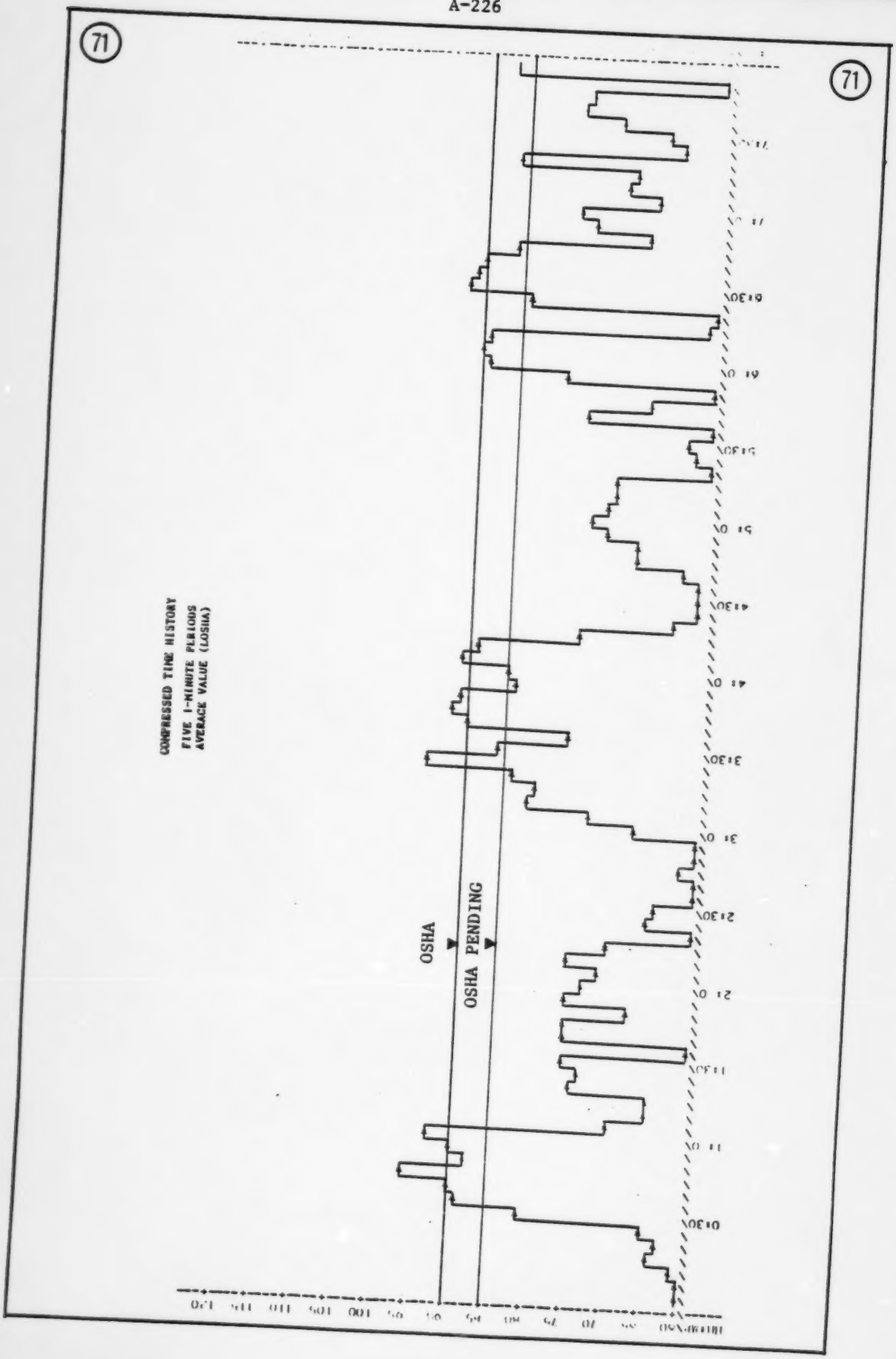
71 AMPLITUDE DISTRIBUTION 71



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
209	43.5	60 TO 64
44	9.2	65 TO 69
52	10.8	70 TO 74
33	6.9	75 TO 79
30	6.3	80 TO 84
42	8.8	85 TO 89
61	12.7	90 TO 94
8	1.7	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


71
71
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30

(72)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1213    60    64     4     1
     210     115200   480
 67  70  77  73  73  73  68  72  71  75  80  74  82  94  83  91
 94  80  78  83  82  81  81  82  82  85  87  83  84  83  99  95
110 110  94 101 108 107  96 110  93 104  86 102 109 106  98 104
105  85  86  80 107 111  87  87  91  95  98 107  98 108 107  92
111 108 107 115  92 115  96 114 113 112  88  92  87  95  87  83
 84  85  86  81  80  85  97  83  85  84  91  91  89  85  86  86
 89 111 110 107 112  90 100 107 113 115  89  89 105  94  81  82
 84  86  92  84  92  95  86  94  91  88  85  93  92  67  65  75
 74  74  75  75  75  74  76  80  83  84  81  73  76  86  93  99
 84  91  98  99 101  92  97  97  99  97  96  96  99  83  82  82
 84  94  83  83  82  82  82  82  82  83  82  82  82  82  82  84
 82  82  82  84  83  83  83  86  84  83  83  82  82  82  84  95
102  84  82  91  99  93  89  89  95  84  97  85  83  97  93  91
 98  92  92  91  98  85  88  84  94  95  82  86  88  87  85  82
 82  82  82  82  82  82  82  82  82  82  82  82  82  82  82  82
 82  82  82  82  82  82  83  83  83  83  83  83  83  83  83  83
 83  84  83  82  83  85  82  84  82  82  82  82  83  82  96  89
 83  85  88  88  85  83  83  83  93  92  87  84  84  84  89  95
 87  85  85  86  88  94  83  84  83  92  88  84  84  83  82  82
 82  82  82  82  82  82  82  82  88  85  84  84  86  83  82  82
 82  82  83  84  85  88  92  83  88  86  87  84  82  82  83  86
 83  82  82  82  84  82  83  95  90  82  89  92  93  98  82  86
 87  89  96  92  88  93  82  82  82  86  82  82  82  82  93  95
 84  84  89  84  89  91  82  87  87  91  87  82  82  82  82  82
 83  82  82  82  82  82  82  82  82  82  82  82  82  82  82  82
 82  82  82  82  82  82  82  82  82  82  82  82  82  82  82  82
 82  82  83  82  83  82  82  92  81  82  81  81  82  82  82  82
 82  82  82  82  82  83  82  82  82  82  82  82  82  82  82  74
 91  75  64  65  71  63  61  61  63  72  77  72  60  70  60  60
 65  61  60  62  64  60  62  75  80  84  79  77  75  70  63  64
%EOF


ENTER LOG DATE (DD/MM/YR) : 26/07/79
ENTER SITE CODE (5 CHARS) : 2GARA
ENTER USER CODE (4 CHARS) : 4714
 ENTER JOB CODE (3 CHARS) : 274

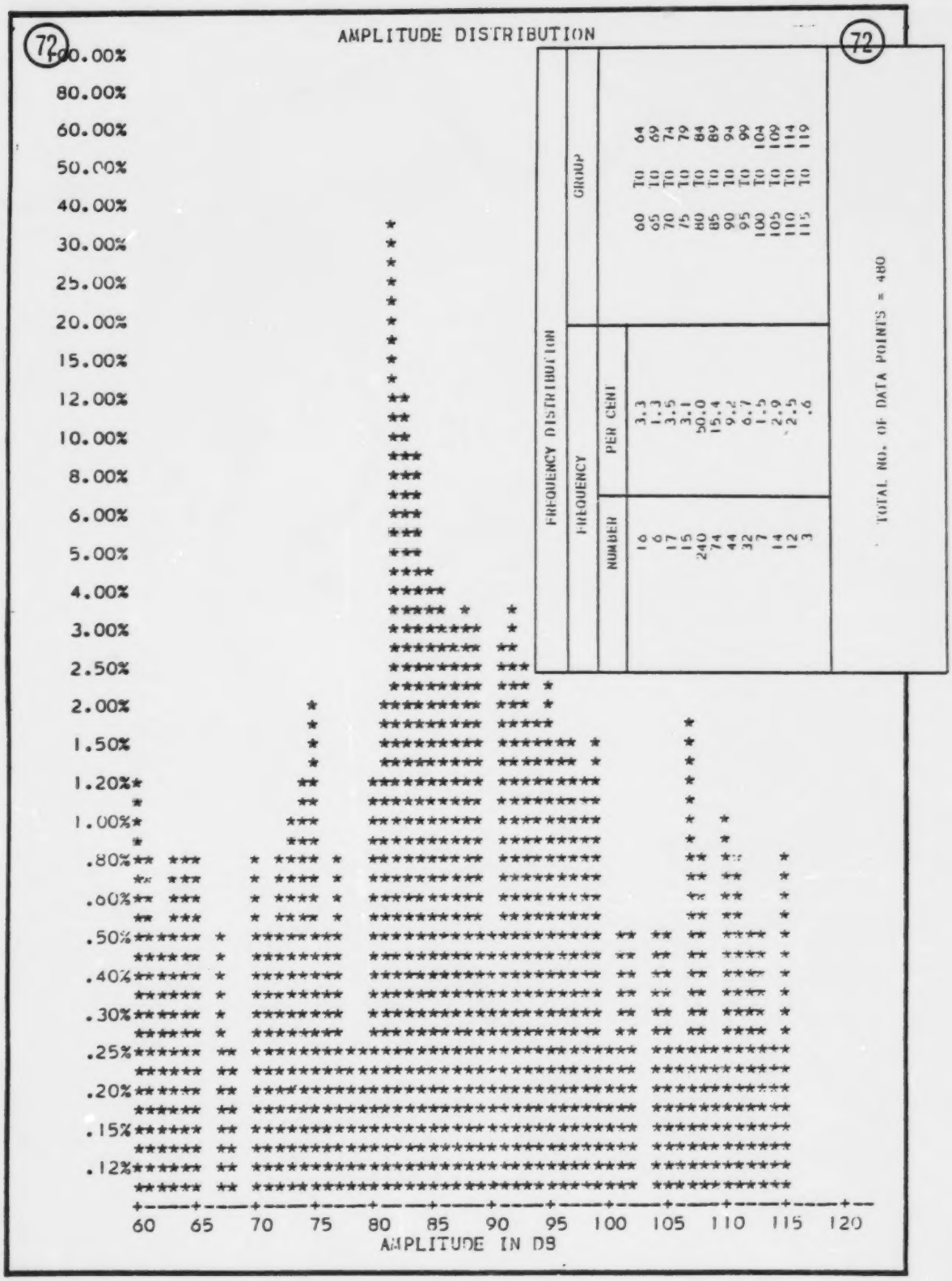

   DATA LOGGED :26 JULY 1979          DATA ANALYZED : 19 SEPT 1979
      LOGGER : DB-301/26                 SITE CODE : 2GARA
SERIAL NUMBER : 1213                      JOB CODE : 274
    BASELINE : 60 DB                     USER CODE : 4714
DYNAMIC RANGE : 54 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC               TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0            STANDBY TIME =   2: 0:52

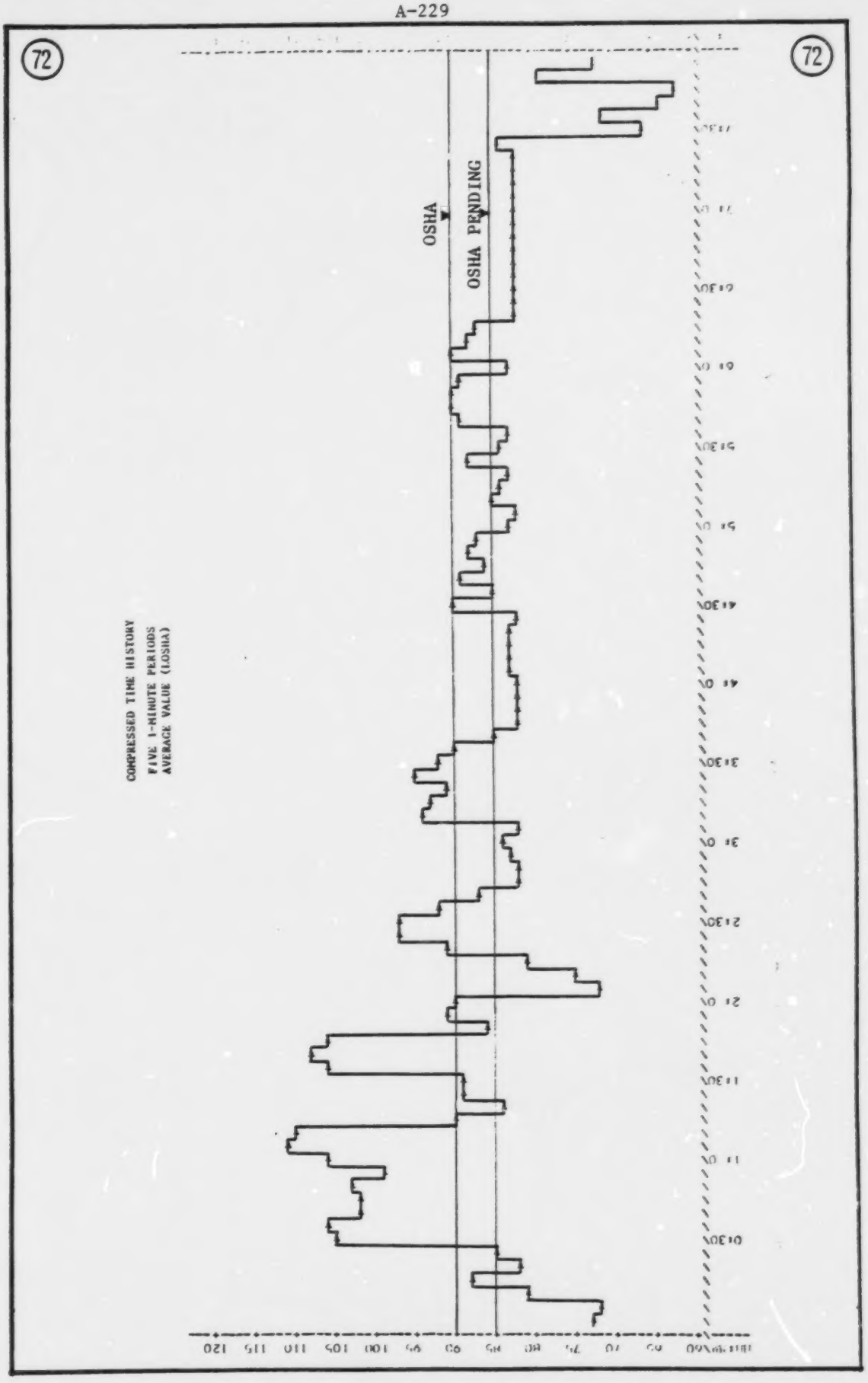
          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 D  / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          OSHA                    %DOSE
HOUR    CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1      98.7       98.7       41.574      41.57
   2     103.4      101.4       79.748     121.32
   3      89.6       99.1       11.759     133.08
   4      89.4       97.7       11.507     144.59
   5      85.7       96.4        6.850     151.44
   6      86.3       95.4        7.458     158.90
   7      84.2       94.6        5.028     164.92
   8      78.7       93.7        2.603     167.13
MIN. COMP. =  60 DB              MAX. COMP. = 115 DB
ARITHMETIC MEAN =  95 DB
STD. DEVIATION =  10 DB
VARIANCE =100 DB
```

(72)


AMPLITUDE DISTRIBUTION
72
72
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 16 3.3
65 TO 69 6 1.3
70 TO 74 17 3.5
75 TO 79 15 3.1
80 TO 84 240 50.0
85 TO 89 74 15.4
90 TO 94 44 9.2
95 TO 99 32 6.7
100 TO 104 7 1.5
105 TO 109 14 2.9
110 TO 114 12 2.5
115 TO 119 3 .6
TOTAL NO. OF DATA POINTS = 480


72
72
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
dBA re 20μN/m²
01:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00

(73)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(73)

```
  1  26  80  1220*  60   64    4    1
      28     115200  480
 60  60  62  60  60  60  64  67  60  61  79  67  73  84  88  89
 93  96  87  89  78  87  80  87  88  85  94  94  90  95  94  96
 93  75  79  64  60  62  72  66  75  73  72  61  67  64  62  62
 66  72  60  63  70  66  63  72  69  69  69  60  63  60  66  61
 68  74  73  64  60  80  85  71  61  59  66  74  71  62  60  64
 68  60  69  71  72  70  77  74  72  76  63  60  65  78  83  83
100 101  97  82  85 101 102 102 102 102  98  78  60  68  72  84
101 101 101 101 101 100  86  77  87  86  88  85  62  73  89  67
 71  73  67  75  65  64  67  70  62  60  77  75  69  74  72  70
 67  70  73  70  65  62  73  61  69  75  78  73  60  60  61  66
 80  64  67  74  73  65  66  70  64  63  72  72  79  78  79  70
 77  77  77  67  75  71  75  76  85  77  92 100  99 101 101  96
 81  81  73  82 101  96  72  76  80  82 100  94  82  80  86  87
 87  87  87  84  81  94 100 100 101 101 101 100 100  88  80  71
 76  72  84  93  99 100 100  91  96  96  97  64  71  73  71  80
 82  79  74  75  76  79  82  76  83  77  70  75  83  79  69  85
 72  70  78  78  76  76  82  70  74  78  80  74  82  79  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  61  69  71  77  80  74  79  81  73  75  96 102 101
 81  81  74  76  77  82  81  60  60  68  63  79  61  64  67  75
 65  60  61  69  73  61  67  66  74  71  62  82  86  80  64  95
 99 100 101 101 101 101 102 102 101 101 101 101 101 101  89  73
 87  66  77  74  61  72  67  67  74  96  96  80  87  67  70  81
 66  80  70  77  68  73  72  71  74  70  78  77  79  78  73  80
 80  80  76  73  71  78  68  72  74  76  73  75  71  60  75 101
101 101 101 101 102 102 100 100 100  98  65  75  80  72  71  71
 70  72  73  74  66  70  66  67  64  88 101 101 104 102 102 102
102 101 102 101 101  79  60  60  65  81  70  74  83  75  84  76
 81  78  81  83  80  74  74  81  77  69  76  75  70  69  60  60
 64  60  83  73  73  77  77  86  80  74  79  92  74  88  93  93
$EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 30/07/79
ENTER SITE CODE (5 CHARS) : SHAFT
ENTER USER CODE (4 CHARS) : 4624
 ENTER JOB CODE (3 CHARS) : 272
```

```
   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : SHAFT
SERIAL NUMBER : 1220                       JOB CODE : 272
     BASELINE : 60 DB                     USER CODE : 4624
DYNAMIC RANGE : 64 DB                      THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0: 7
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	83.5	83.5	5.106	5.11
2	91.4	88.5	15.148	20.25
3	75.2	86.1	1.609	21.86
4	93.4	88.7	19.971	41.83
5	75.0	87.4	1.563	43.40
6	92.5	88.5	17.621	61.02
7	89.9	88.7	12.385	73.40
8	90.9	89.0	14.159	87.56

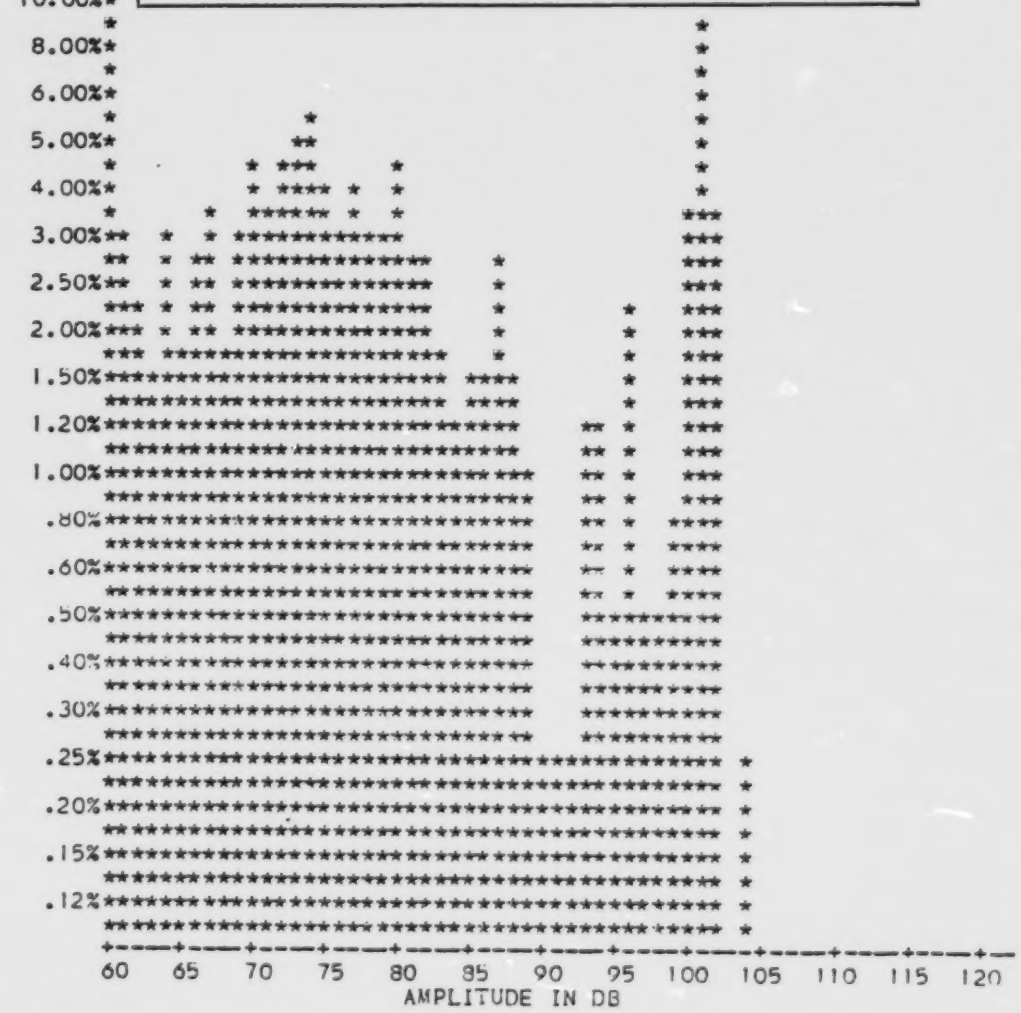
MIN. COMP. = 60 DB MAX. COMP. = 104 DB
ARITHMETIC MEAN = 77 DB
STD. DEVIATION = 13 DB
VARIANCE =169 DB

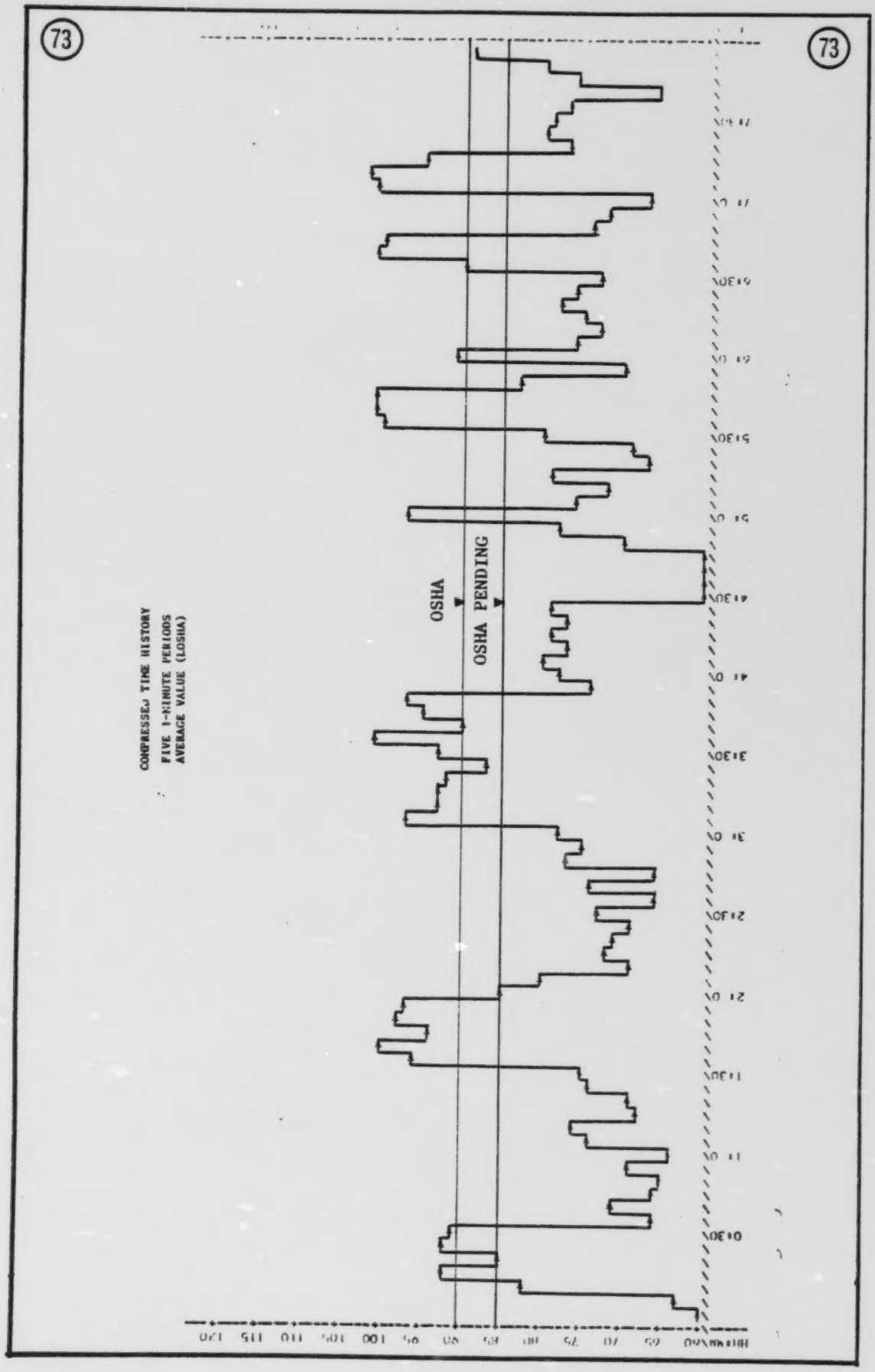
AMPLITUDE DISTRIBUTION

(73) (73)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
88	18.3	60 TO 64
51	10.6	65 TO 69
93	19.4	70 TO 74
70	14.6	75 TO 79
51	10.6	80 TO 84
33	6.9	85 TO 89
13	2.7	90 TO 94
18	3.8	95 TO 99
63	13.1	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




73
73
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
dBA re 20 uPa
65
70
75
80
85
90
95
100
105
110
115
120

(74)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(74)

1 26 80 1216 60 64 4 1
129 115200 480

60	60	60	60	63	60	60	60	61	60	60	60	66	61	62	61
60	60	60	60	60	60	63	61	62	65	66	67	60	60	68	71
67	67	60	61	65	63	61	60	60	61	60	60	71	67	71	85
84	61	89	80	60	60	85	65	60	60	60	73	68	74	60	64
63	61	72	60	60	63	75	76	75	67	92	69	66	84	60	64
75	83	62	87	64	65	68	92	72	64	65	66	66	77	60	60
60	60	60	60	60	62	67	60	60	60	60	60	60	60	60	60
60	60	60	62	60	60	60	60	60	87	93	89	94	95	103	99
95	99	96	92	102	105	103	95	97	93	85	92	96	97	95	96
84	81	80	60	63	60	60	61	84	98	100	100	100	103	99	94
98	99	103	99	100	97	104	102	98	99	103	102	107	110	105	104
99	96	105	108	111	106	106	96	99	99	93	97	95	97	96	95
101	95	94	99	97	96	100	100	104	99	105	102	105	104	100	99
106	102	105	104	98	100	104	100	100	100	95	94	96	106	97	102
99	100	96	97	101	104	99	102	103	103	100	102	100	99	100	96
95	97	101	99	94	103	102	93	88	87	85	80	96	97	102	103
99	103	101	101	99	102	102	102	100	104	102	95	106	105	102	102
103	100	104	100	103	98	97	97	98	106	99	96	100	102	99	95
91	95	96	92	89	60	60	60	85	60	60	60	74	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	78	90	99	102
104	101	107	105	107	107	106	99	101	102	95	95	96	101	99	96
101	100	97	84	60	60	89	97	101	97	106	100	105	106	101	94
85	86	97	100	105	104	98	97	100	77	66	80	60	86	97	98
104	102	102	100	105	102	106	100	98	93	88	95	94	101	100	104
106	95	66	60	60	71	95	95	98	102	96	98	82	60	60	60
79	94	97	96	99	102	96	101	98	99	88	90	100	99	104	96
106	102	106	107	107	106	104	108	103	102	98	100	107	100	101	109
105	110	109	109	104	97	101	97	99	99	99	97	97	96	92	100
94	98	99	101	106	108	106	100	99	99	100	96	60	89	92	91
90	80	91	75	60	62	60	60	60	60	60	70	83	86	76	87

ENTER LOG DATE (DD/MM/YR) : 22/08/79
ENTER SITE CODE (5 CHARS) : 29950
ENTER USER CODE (4 CHARS) : 4640
ENTER JOB CODE (3 CHARS) : 273

DATA LOGGED :22 AUG 1979
LOGGER : 04-301/24
SERIAL NUMBER : 1214
BASELINE : 60 DB
DATA IC CALIB : 60 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 : 0

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 29950
JOB CODE : 273
USER CODE : 4640
THRESHOL : 60 DB
TOTAL SAMPLES = 11521
STANDARD TIME = 0 : 0

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TLV. LEVEL = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME PERIOD	OSHA CURRENT	OSHA CUMULATIVE	NOISE CURRENT	NOISE CUMULATIVE
1	70.4	70.4	.820	.82
2	77.4	74.7	2.187	2.99
3	99.1	91.7	44.294	47.29
4	101.5	95.6	61.393	104.68
5	98.9	96.4	42.854	151.70
6	98.2	96.7	39.217	190.91
7	98.5	97.0	40.345	231.32
8	100.3	97.5	52.230	283.66

MIN. COMP. = 60 DB
ARITHMETIC MEAN = 86 DB
STD. DEVIATION = 14.0
VARIANCE = 196

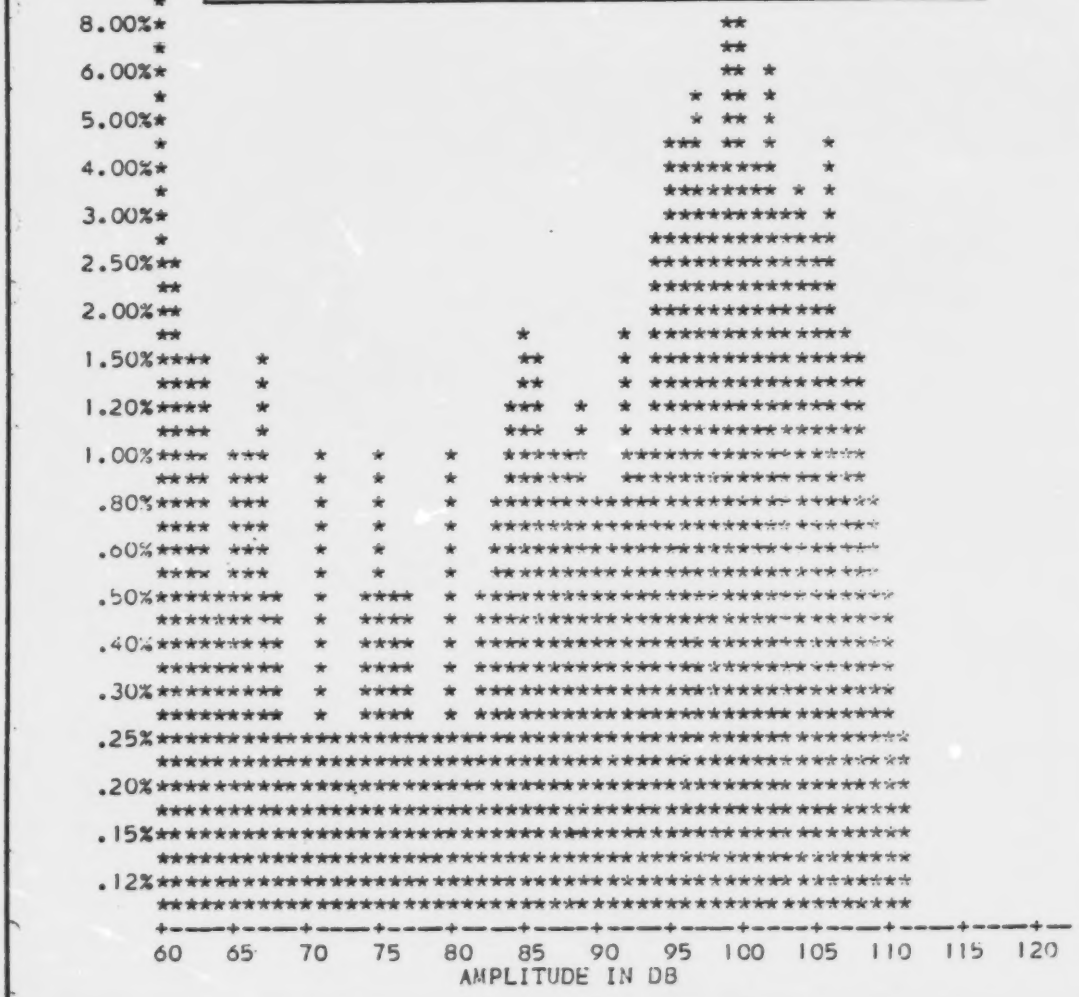
MAX. COMP. = 111 DB

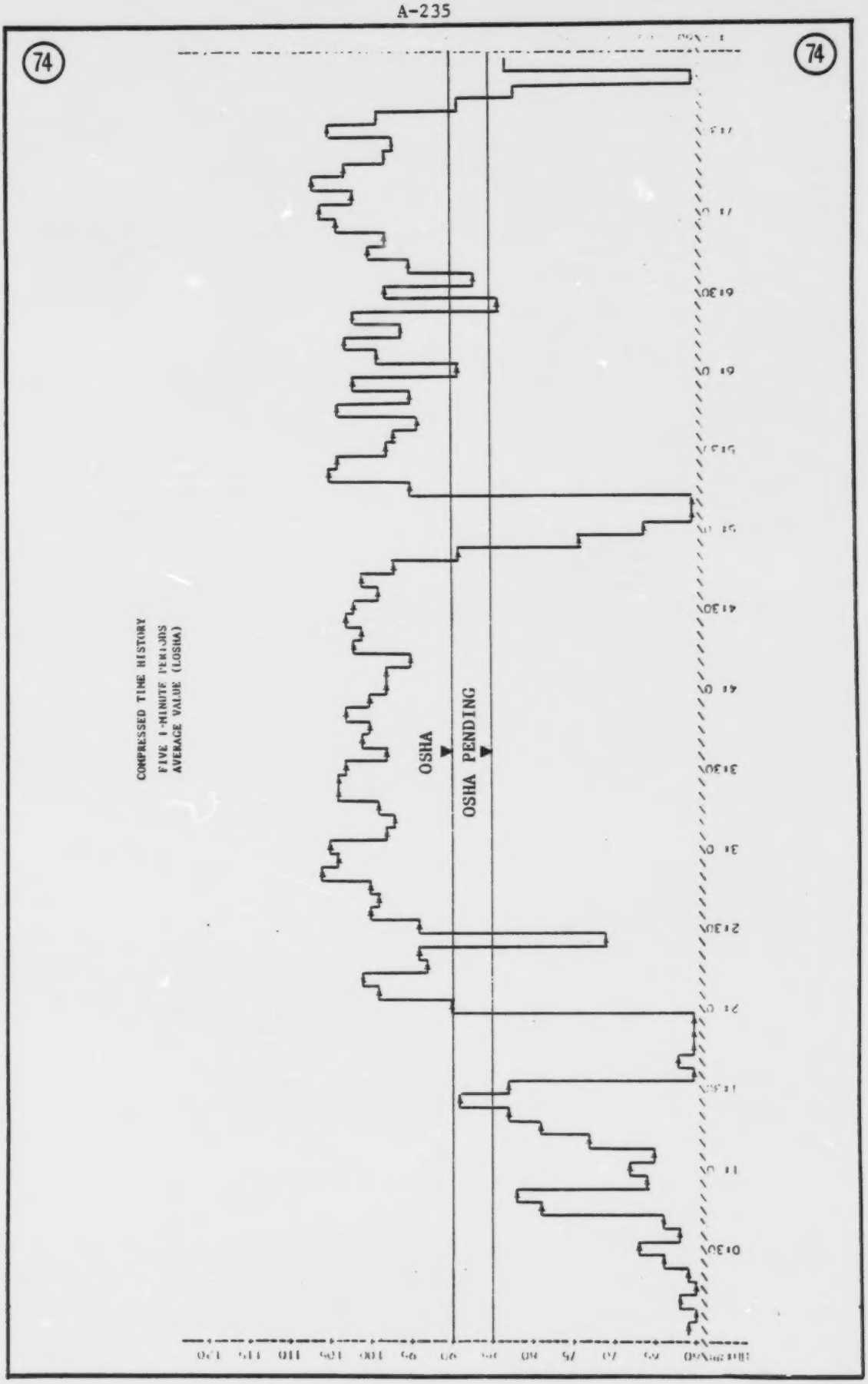
AMPLITUDE DISTRIBUTION

(74) (74)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
120	25.0	60 TO 64
17	3.5	65 TO 69
9	1.9	70 TO 74
10	2.1	75 TO 79
15	3.1	80 TO 84
26	5.4	85 TO 89
28	5.8	90 TO 94
108	22.5	95 TO 99
100	20.8	100 TO 104
44	9.2	105 TO 109
3	.6	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




74
74
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(75)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1213 60 64 4 1
136 115200 480

60	60	60	65	61	60	60	60	63	66	62	60	60	70	76	60
65	84	78	72	76	79	81	72	75	78	81	95	93	97	98	92
86	85	82	89	90	92	93	92	90	89	95	95	89	85	76	60
60	60	60	60	60	60	60	63	61	60	61	60	60	60	61	60
60	60	60	60	60	60	60	62	60	60	60	60	60	63	60	60
60	60	60	60	61	62	60	60	60	62	64	67	70	60	60	63
67	72	65	76	67	61	61	62	65	60	65	61	66	69	61	68
60	60	60	60	62	66	60	60	64	60	60	63	60	72	65	75
74	74	74	65	75	66	73	70	77	74	75	81	69	60	80	80
71	74	84	61	67	90	63	69	90	95	90	87	82	95	91	61
60	67	61	66	61	60	67	60	61	60	62	86	96	79	60	60
64	76	62	61	69	60	60	84	77	60	62	60	79	69	65	74
72	60	60	70	66	78	63	60	98	69	60	66	73	63	90	60
60	60	85	60	62	60	60	60	72	60	60	89	61	72	90	90
89	68	61	60	60	60	82	69	61	60	64	70	72	66	61	60
60	82	82	68	66	79	64	60	64	65	60	60	62	62	90	90
61	62	60	60	67	75	60	60	60	63	60	60	60	60	60	60
61	60	84	60	60	62	60	60	60	61	83	60	60	66	60	60
73	60	87	66	60	60	60	60	60	62	61	64	60	84	72	67
60	61	64	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	71	77	85	65	82	85	63	66	63	60	62	72	85
64	66	60	60	60	63	63	78	73	81	66	74	62	71	90	62
65	64	62	76	61	85	63	60	83	63	79	64	71	90	62	72
68	77	66	64	67	70	68	70	62	73	78	68	72	76	61	64
69	61	60	62	60	60	60	60	62	60	61	67	66	58	84	81
69	80	80	62	72	70	61	61	67	72	60	70	62	93	68	85
63	60	76	62	60	60	63	60	60	66	67	63	60	73	66	68
69	79	75	77	78	82	75	70	68	60	65	60	63	64	67	62
62	65	60	60	66	70	88	86	83	71	68	63	64	70	71	74
66	68	78	71	60	60	62	60	60	60	62	61	77	91	92	93

END OF

(75)

ENTER LOG DATE (DD/MM/YR) : 21/08/79
ENTER SITE CODE (5 CHARS) : 30950
ENTER USER CODE (4 CHARS) : 4088
ENTER JOB CODE (3 CHARS) : 274

DATA LOGGED :21 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1213
CHANNELS : 50 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8[illegible]

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 30950
JOB CODE : 274
USER CODE : 4088
TAPE SERIAL : 60
TOTAL SAMPLES = 115200
STANDARD LIFT = [illegible]

TIME HISTORY ANALYSIS

NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
SAMPLING (LOGGING) RATE = [illegible]
THRESHOLD (CHANGE) LEVEL = [illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGGER		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	66.5	64.5	5.051	5.05
2	63.2	79.9	.305	6.16
3	74.1	78.3	1.497	7.65
4	75.2	77.8	1.605	9.26
5	71.9	77.0	1.017	10.28
6	73.3	76.5	1.240	11.52
7	74.8	76.3	1.511	13.03
8	75.2	76.2	1.635	14.66

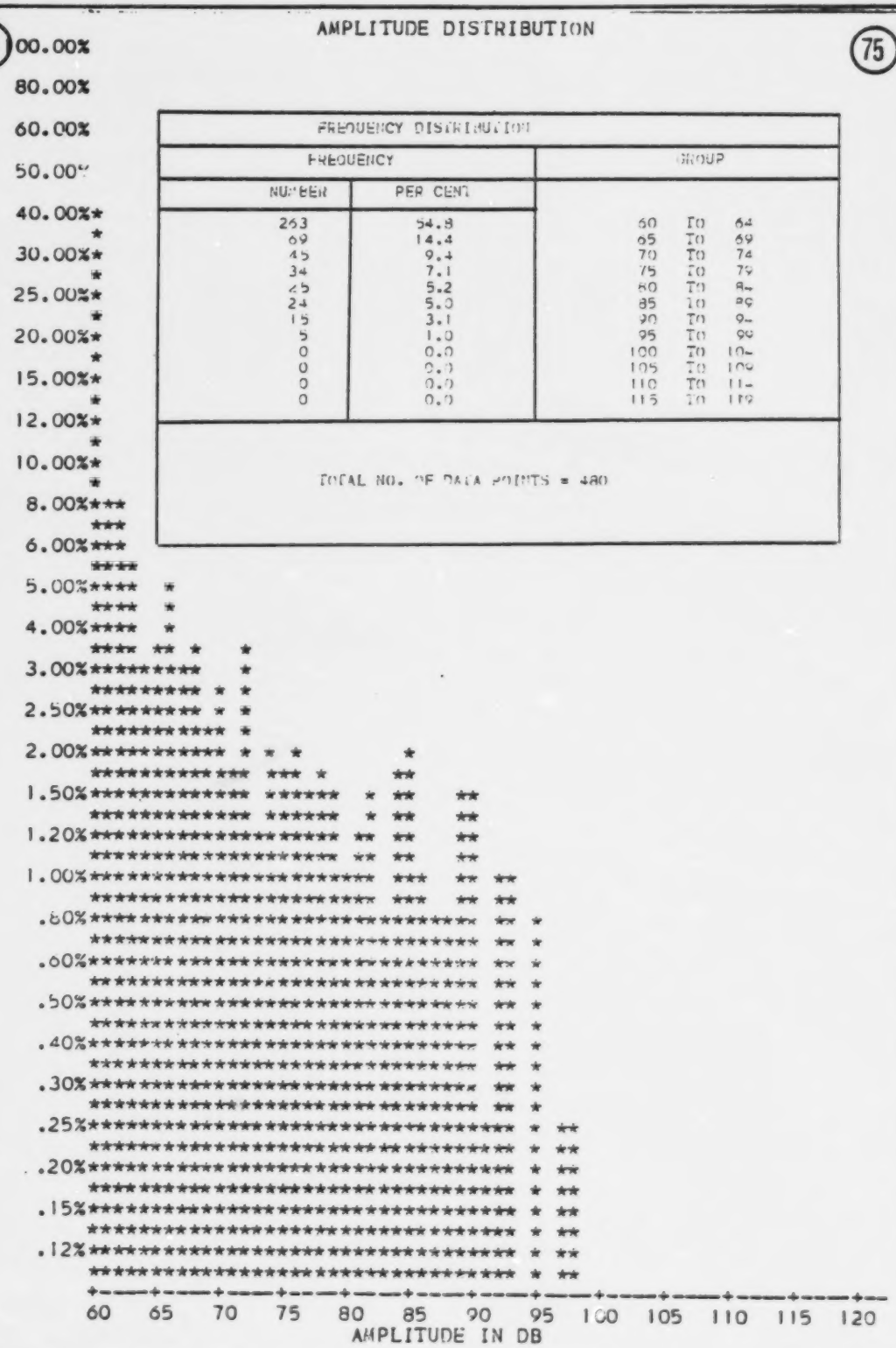
MIN. COMP. = 60 DB MAX. COMP. = 98 DB
ARITHMETIC MEAN = 67 DB
STD. DEVIATION = [illegible]
VARIANCE = [illegible]

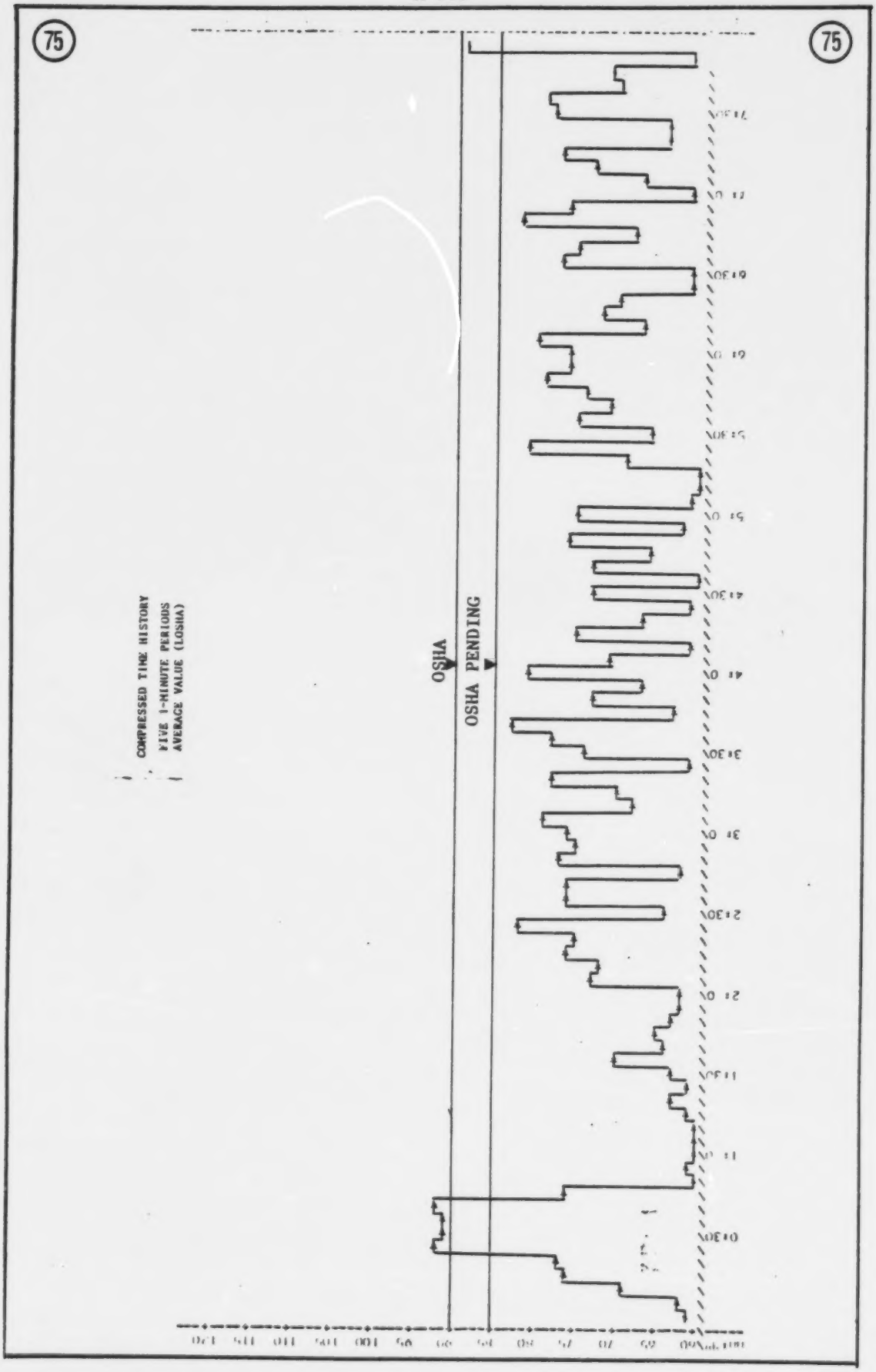
AMPLITUDE DISTRIBUTION

(75) (75)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
263	54.8	60 TO 64
69	14.4	65 TO 69
45	9.4	70 TO 74
34	7.1	75 TO 79
25	5.2	80 TO 84
24	5.0	85 TO 89
15	3.1	90 TO 94
5	1.0	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




75
75
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
120
115
110
105
100
95
90
85
80
75
70
65
60
dBA re 20 μPa

(76)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1212   60   64    4    1
     319     115200  480
 60  60  60  60  60  60  60  60  60  60  61  60  60  60  60  67
 67  77  60  71  63  63  62  67  75  72  63  61  69  68  63  63
 80  98  95  85  80  83  88  86  94  96  98  82  81  84  90  96
 97  91  97  94  94  95  87  94  88  93  98  91  93  84  94  91
 80  85  96  95  94  96  92  93  95  96  84  77  74  80  71  66
 61  67  70  68  62  62  67  69  73  63  61  75  77  78  69  79
 63  82  75  74  78  72  71  60  75  77  60  72  72  62  60  77
 60  60  69  67  67  80  87  60  60  76  65  78  60  80  60  60
 60  75  90  89  88  97  94  90  92  89  82  80  87  85  108 103
106 106 107 102 106 106 106 100 110 105 106 107 105 106 106 107
106 106 107 97  89  94  105 105 109 106 106 108 107 93  105 85
 91  104 97  95  93  97  102 107 106 101 97  109 104 110 105 106
108 106 109 108 108 107 110 109 108 110 106 108 106 109 108 105
107 109 103 98  97  96  89  86  87  89  102 110 103 109 106 109
107 106 105 110 108 110 106 108 109 107 95  108 100 98  109 106
106 107 108 110 104 108 98  109 108 109 102 110 105 106 90  108
107 97  100 78  76  98  92  69  65  62  61  60  61  65  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  62  60  64  62  60  62  56  64  82  74  84  74  60
 73  77  67  92  85  84  84  85  86  84  94  99  95  92  88  93
 94  93  94  94  90  91  94  93  95  95  96  96  107 106 109 105
105 109 98  97  105 106 108 106 107 107 106 109 106 107 106 108
107 105 106 108 109 96  87  85  97  97  89  88  88  86  87  85
 94  93  103 107 110 107 107 107 108 104 108 105 111 103 109 106
106 112 108 92  90  92  88  93  88  89  93  97  91  96  88  87
 88  87  87  87  87  87  60  60  60  60  86  84  75  76  93  89
 82  80  82  79  82  86  85  84  83  84  83  77  84  84  83  86
 85  84  83  86  93  103 73  68  73  79  73  62  65  75  60  71
 70  71  69  65  73  83  70  64  85  71  74  69  66  68  76  62
 67  72  70  68  75  93  97  94  94  93  87  95  92  89  94  87
%EOF

ENTER LOG DATE (DD/MM/YR) : 13/08/79
ENTER SITE CODE (5 CHARS) : 32950
ENTER USER CODE (4 CHARS) : 4694
 ENTER JOB CODE (3 CHARS) : 4H1

   DATA LOGGED :13  AUG 1979
       LOGGER : DB-301/26
SERIAL NUMBER : 1212
      BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   8  HR  0

DATA ANALYZED : 20 SEPT 1979
    SITE CODE : 32950
     JO  CODE : 4H1
    USER CODE : 4694
    THRESHOLD :  80 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =    0  HR  0

          4 HR HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% USE =  8 HRS / 5 DAYS
EXCHANGE (OR 3 DB) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LEQ(A                    DOSE
HOUR     CURRENT   CUMULATIVE      CURRENT   CUMULATIVE
   1        86.9        86.9        8.110        8.11
   2        84.1        85.6        5.531       13.64
   3       101.0        97.3       60.523       74.17
   4       106.1        99.8      116.298      190.47
   5        98.1        99.5       38.433      228.90
   6       101.3        99.8       59.903      288.70
   7        99.7        99.8       48.253      337.00
   8        95.9        99.0        7.040      344.00
MIN. COMP. =  80 DB
ARITHMETIC MEAN =  96 DB
STD. DEVIATION =  17 DB
VARIANCE = 289 DB
MAX. COMP. =  112 DB
```

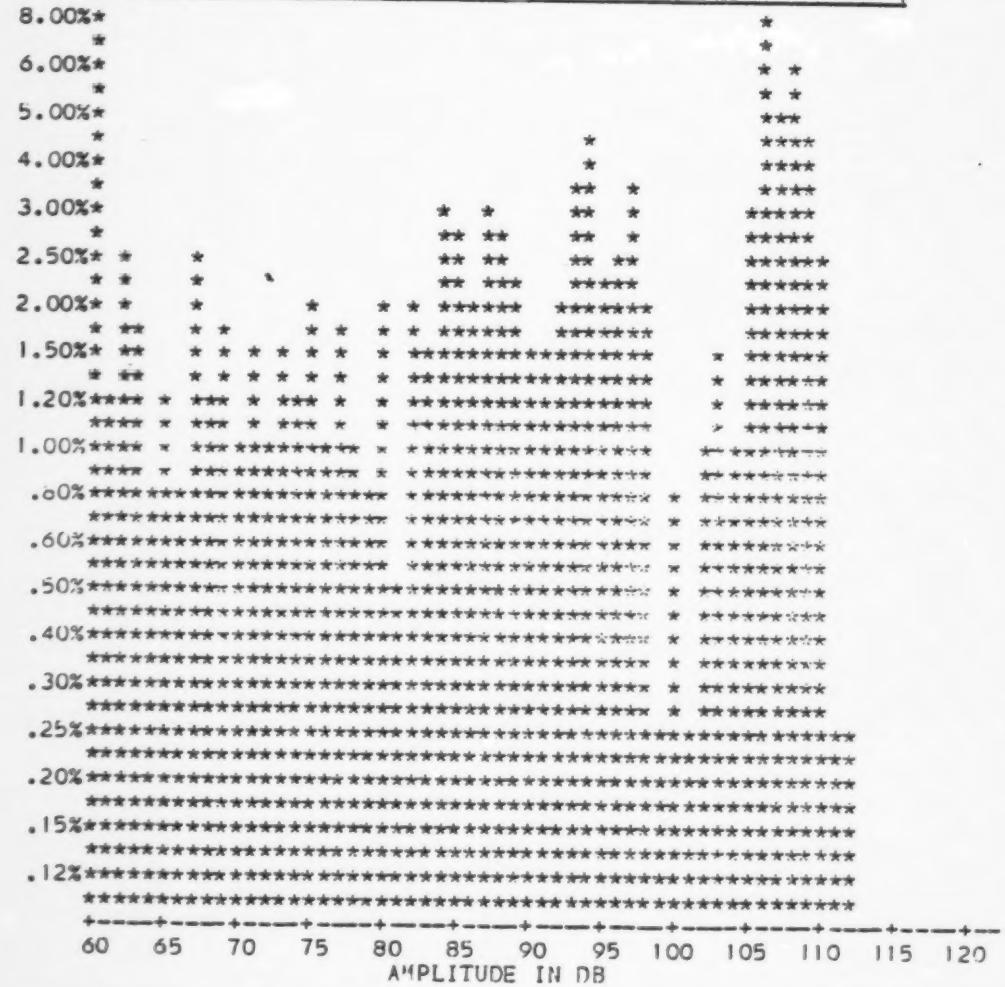
(76)

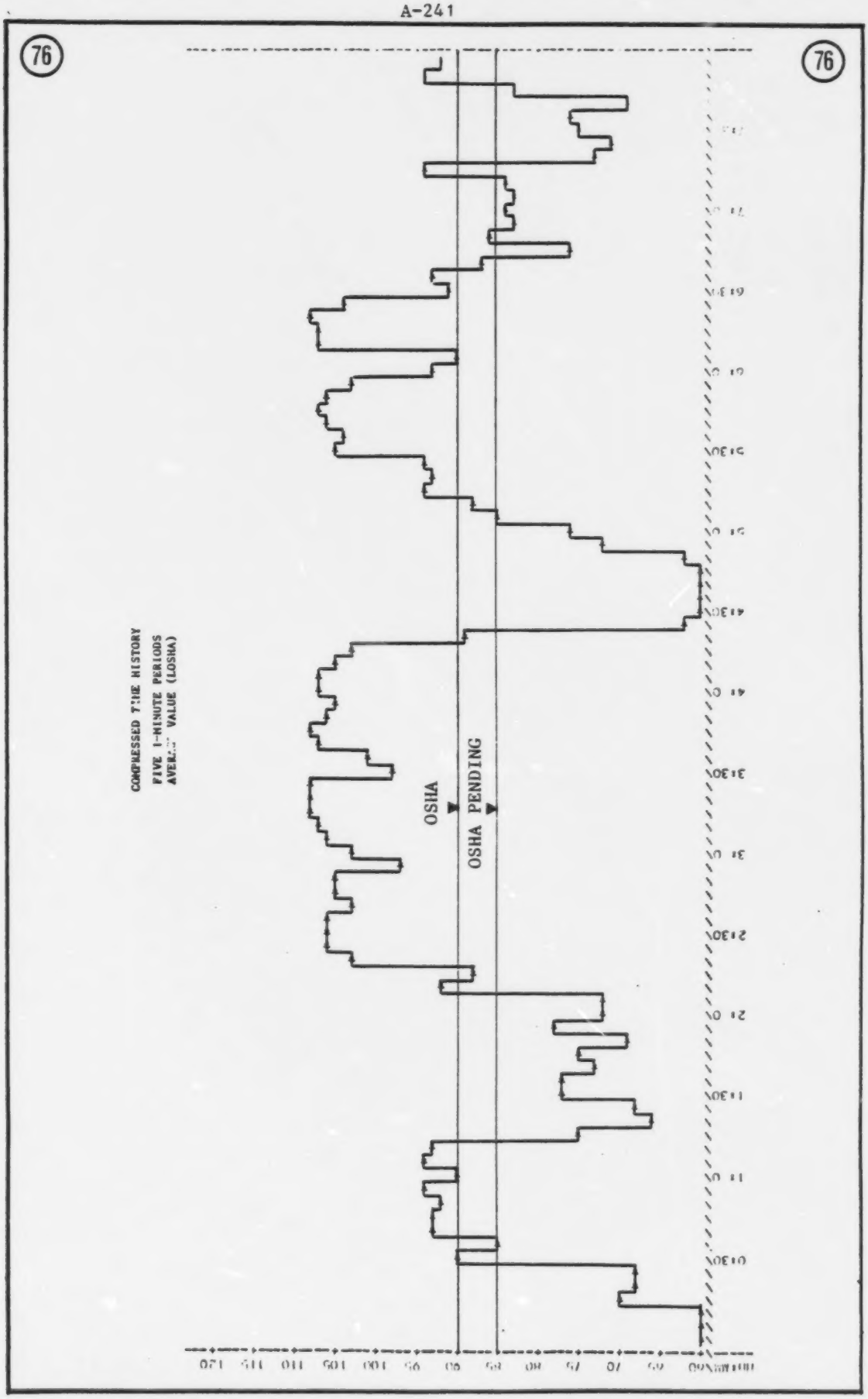
76 AMPLITUDE DISTRIBUTION 76

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
81	16.9	60 To 64
30	6.3	65 To 69
25	5.2	70 To 74
26	5.4	75 To 79
37	7.7	80 To 84
52	10.8	85 To 89
52	10.8	90 To 94
42	8.8	95 To 99
18	3.8	100 To 104
105	21.9	105 To 109
12	2.5	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




76
76
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(77)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1218 60 64 4 1
53411 78034 325

60	62	61	60	61	61	62	70	67	63	66	60	64	73	60	62
63	60	64	66	62	67	77	82	89	85	82	80	80	84	84	96
101	95	93	96	95	97	95	95	92	91	95	92	89	87	88	92
81	74	66	60	60	60	60	60	62	60	60	60	60	60	60	66
60	60	60	62	60	60	60	60	61	60	60	77	70	62	60	60
60	60	60	60	60	64	61	60	60	60	60	70	61	60	60	63
79	75	73	64	62	60	60	65	85	61	74	62	60	66	73	60
72	89	67	78	81	85	87	95	85	84	93	89	108	102	106	86
60	63	60	60	62	63	93	60	101	89	103	105	111	74	111	104
107	86	90	101	85	107	97	89	96	107	110	109	110	112	109	111
97	89	110	94	96	98	112	108	112	110	113	108	108	91	95	92
88	87	87	82	89	92	81	91	96	95	104	97	90	105	106	107
107	109	111	110	109	109	98	86	88	89	88	89	87	97	100	104
104	102	101	93	94	92	102	102	95	63	60	60	60	60	60	60
60	60	60	60	60	60	60	61	60	60	60	60	60	63	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	63	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

>SUP

ENTER LOG DATE (DD/MM/YR) : 22/08/79
ENTER SITE CODE (5 CHARS) : 32950
ENTER USER CODE (4 CHARS) : 4701

ENTER JOB CODE (3 CHARS) : 273

DATA LOGGED :22 AUG 1979
LOGGER : 3M-301/26
SERIAL NUMBER : 1218
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 5:25: 0

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 32950
JOB CODE : 273
USER CODE : 4701
THRESHOLD : 80 DB
TOTAL SAMPLES = 1:034
STANDBY TIME = 3:42:52

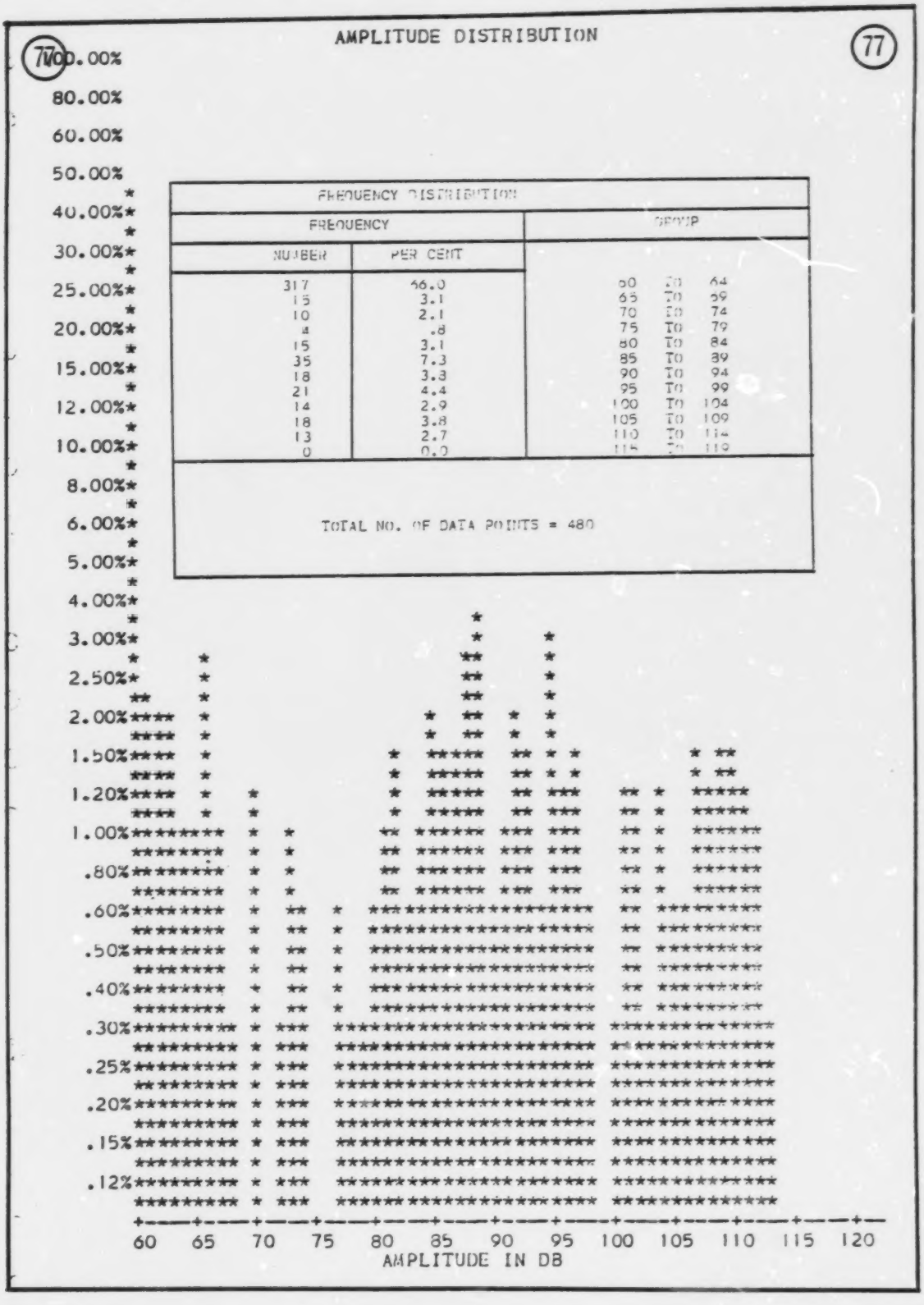
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% NOISE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 325
PERIOD = 1 MINUTES

TIME	LOGIA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	86.2	86.2	7.402	7.40
2	77.3	83.1	2.190	9.60
3	103.7	96.5	83.016	92.61
4	98.1	97.0	38.642	131.26
5	60.1	95.4	.197	131.45
6	60.0	94.8	.081	131.53

MIN. COMP. = 60 DB MAX. COMP. = 113 DB
ARITHMETIC MEAN = 75 DB
STD. DEVIATION = 18 DB
VARIANCE =324 DB

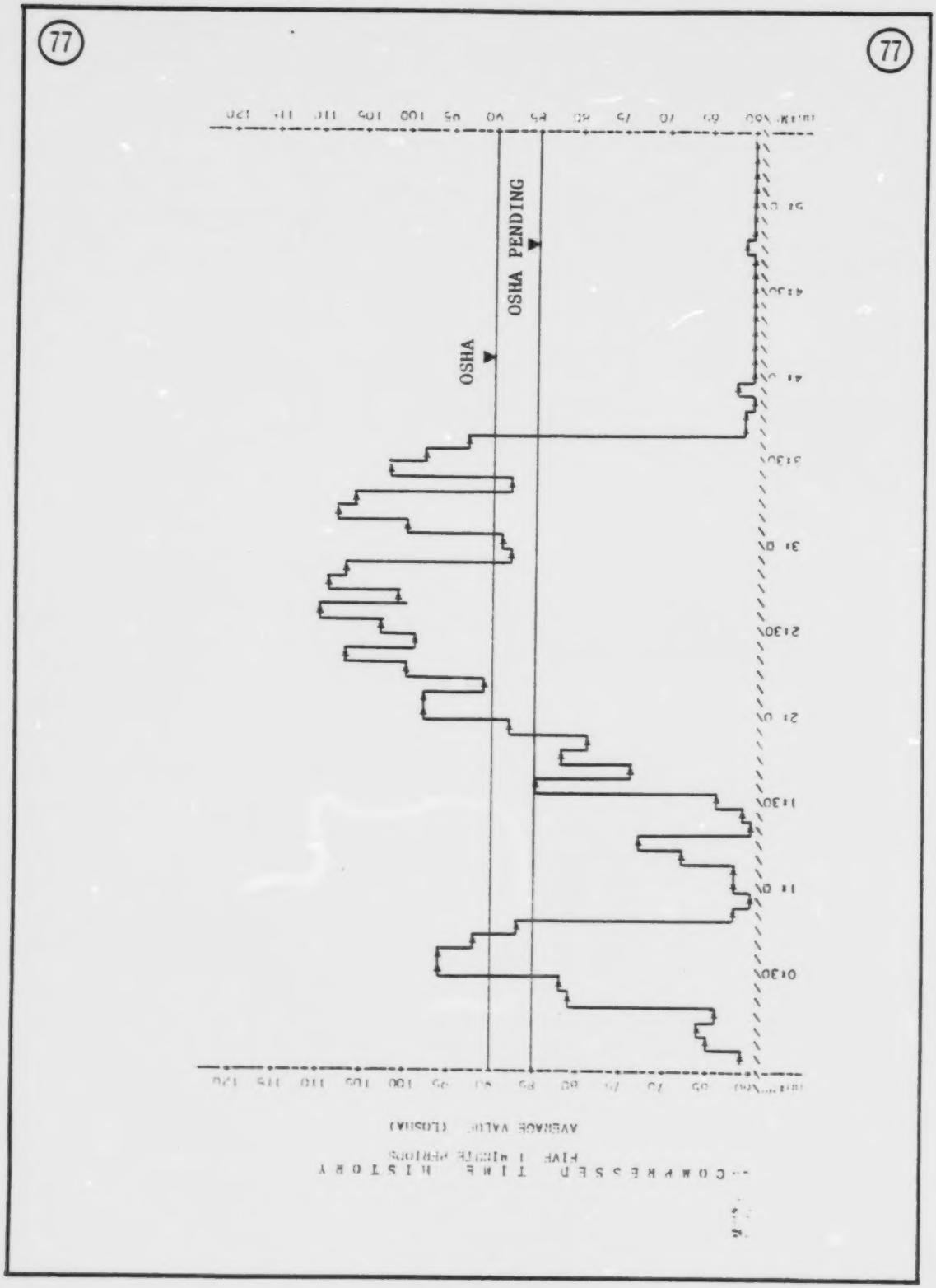
(77)



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
317	66.0	60 TO 64
15	3.1	65 TO 69
10	2.1	70 TO 74
4	.8	75 TO 79
15	3.1	80 TO 84
35	7.3	85 TO 89
18	3.8	90 TO 94
21	4.4	95 TO 99
14	2.9	100 TO 104
18	3.8	105 TO 109
13	2.7	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


77
77
OSHA
OSHA PENDING

78

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1216    60    64     4     1
     701     115200  480
 60  60  60  60  63  66  65  60  60  60  69  60  60  60  60  60
 60  60  61  62  64  60  62  69  69  66  68  77  78  77  72  60
 60  61  87  87  82  82  77  87  92  86  80  66  80  84  91  92
 93  95  72  93  87  94  94  96  96  94  93  93  86  96  95  93
 96  87  96  92  96  92  85  78  77  77  73  73  66  71  71  69
 65  62  67  73  73  62  62  78  66  66  85  88  86  86  90  92
 87  90  91  81  84  84  87  84  87  78  81  73  77  71  74  102
104 105 101  88 104 105 103 101 102  99 100 101 104 102 102 106
103  90  90  84 107 108 106 109 106  76  94  92  85  95  92 107
100 103 104 101 104  85  87  83 107 104 108 105 104  96 108 106
102 104  91  88  80  74  70  80  85  82  85  87  83  84  86  80
 80  80  69  70  82 101 100  93  82  82  82  85  88  89  86  89
 86  86  79  81  86  81  84  84  80  69  65  72  91  90  90  87
 86  84  85  86  82  81  86  85  85  82  86  84  80  81  83  83
 84  86  84  84  84  81  78  87  81  82  83  81  79  79  84  84
 77  60  67  76  80  86  94  99  73  73  68  61  60  63  64  67
 62  60  60  60  60  69  69  60  74  62  70  66  64  60  61  66
 60  61  60  60  60  70  63  60  60  60  60  60  60  60  63  60
 65  62  74  68  68  67  80  91  91  82  76  72  65  65  69  65
 69  60  60  63  65  60  60  60  65  81  68  63  64  60  60  62
 62  60  60  60  62  68  65  75  77  68  60  60  60  74  62  65
 78  82  81  72  71  73  83  61  71  61  65  76  60  64  69  67
 66  60  60  60  60  78  85  91  89  90  84  84  83  68  68  66
 75  73  81  79  68  85  78  83  87  83  85  81  80  89  84  84
 82  85  84  86  84  84  83  79  76  87  88  84  86  87  83  86
 84  82  82  79  86  83  86  85  84  84  84  87  85  84  82  86
 85  84  80  84  85  83  76  83  82  75  83  80  73  70  76  76
 75  78  76  69  63  78  86  60  83  87  88  65  72  66  60  62
 70  69  61  64  71  69  68  67  65  68  73  65  64  62  64  67
 67  67  68  69  76  74  79  83  87  85  94  96  93  96  92  97
*END
```

78

```
ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 32950
ENTER USER CODE (4 CHARS) : 4694
 ENTER JOB CODE (3 CHARS) : WIH
```

```
   DATA LOGGED :14  AUG 1979
        LOGGER : 08-301/26
SERIAL NUMBER : 1216
      BASELINE : 50 DB
DYNAMIC RANGE : 54 DB
SAMPLING RATE :  4/SEC
TEST DURATION =  [illegible]
```

```
DATA ANALYZED : 21 SEPT 1979
    SITE CODE : 32950
     JOB CODE : WIH
    USER CODE : 4694
   THRESHOLD : 80 DB
TOTAL SAMPLES =  115200
 SAMPLES TAKEN =  [illegible]
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOSHA CRIT = [illegible] / 8 HRS
EXCHANGE (DOUBLING) RATE = [illegible]
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LEVEL		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	84.5	84.5	5.848	5.85
2	92.2	89.3	16.906	22.75
3	102.1	94.8	50.429	73.18
4	96.2	93.4	7.310	80.49
5	77.6	92.0	2.232	82.72
6	72.5	90.8	1.106	83.83
7	83.7	90.1	5.391	89.22
8	82.4	89.5	4.369	93.59

```
MIN. COMP. =  80 DB                MAX. COMP. = 109 DB
ARITHMETIC MEAN =  [illegible] DB
STD. DEVIATION =  [illegible]
VARIANCE =  [illegible]
```

78

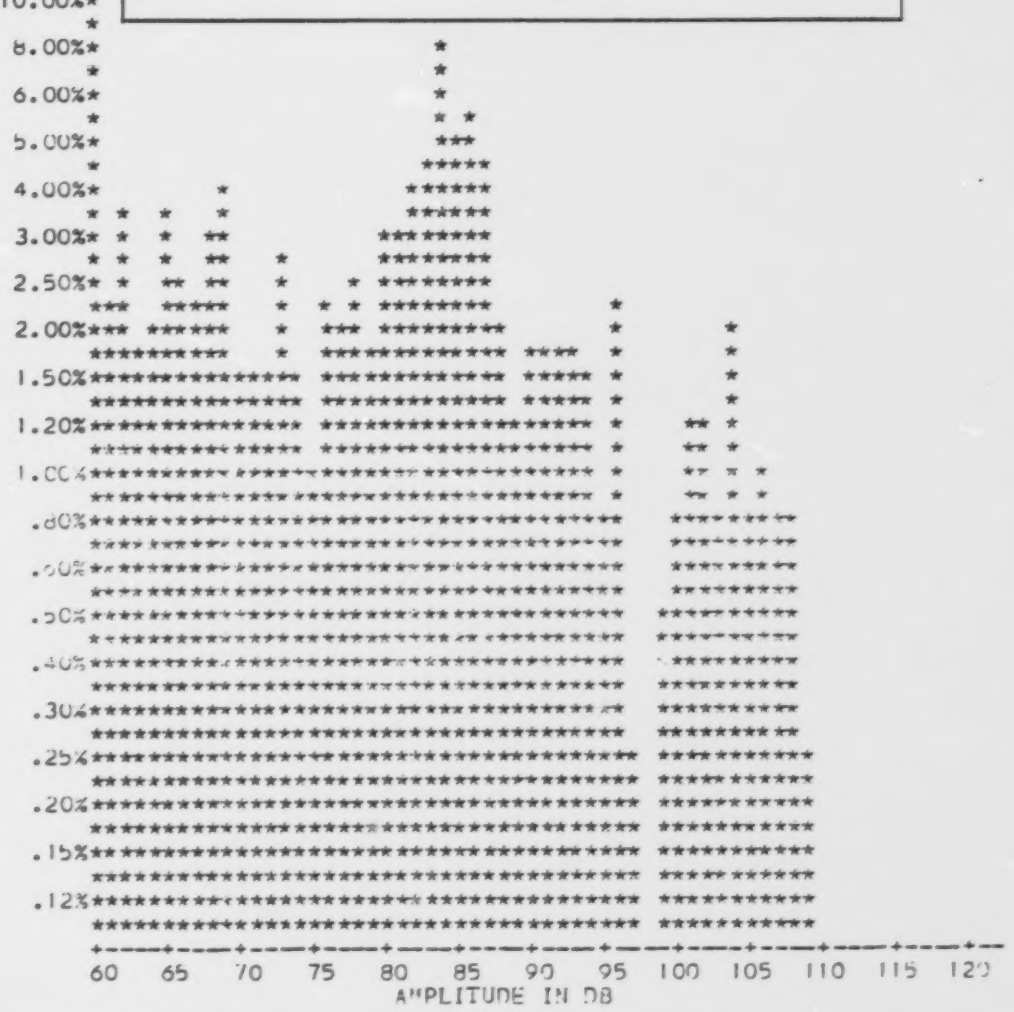
AMPLITUDE DISTRIBUTION

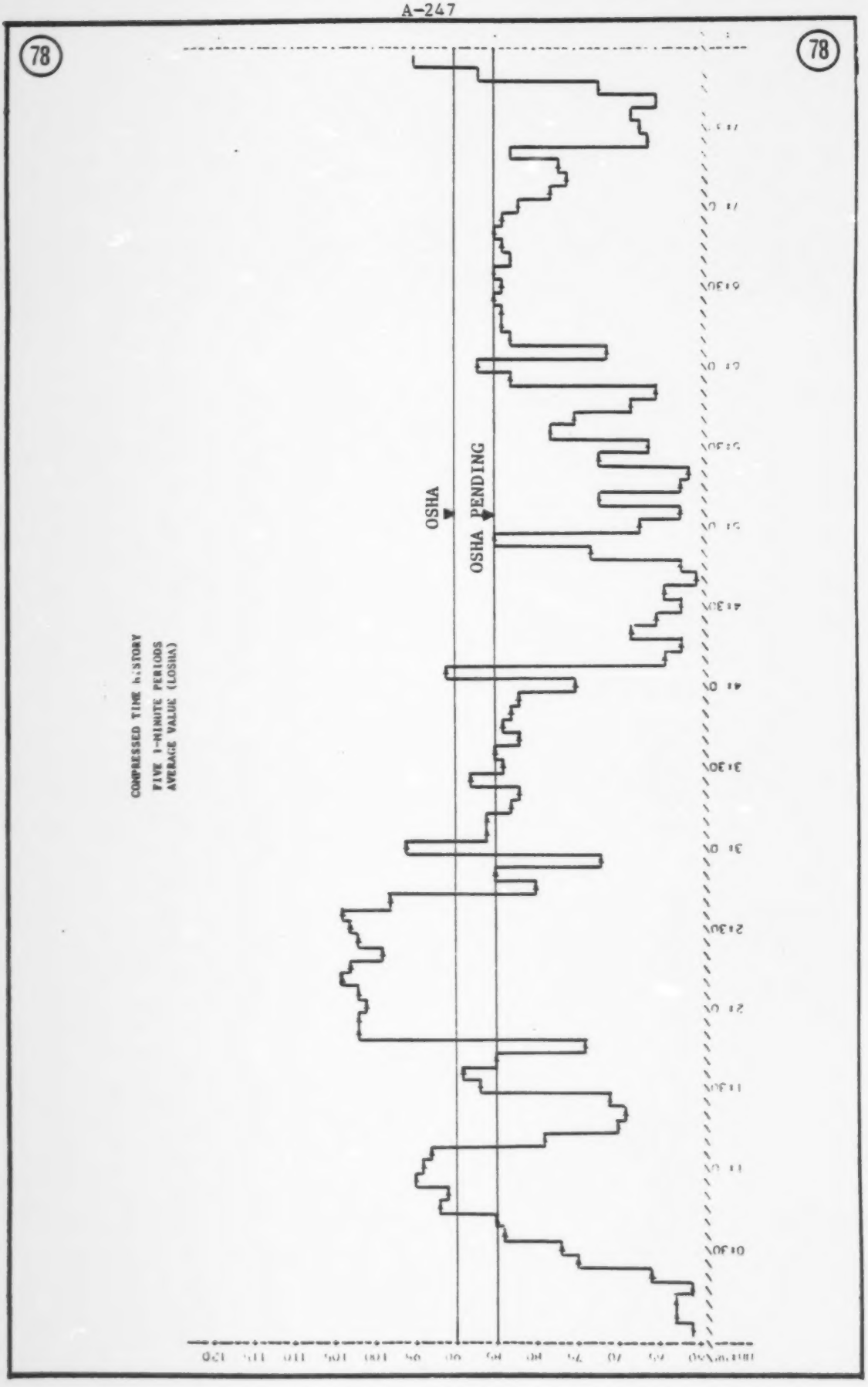
78

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
97	20.2	60 TO 64
63	13.1	65 TO 69
35	7.3	70 TO 74
38	7.9	75 TO 79
88	18.3	80 TO 84
72	15.0	85 TO 89
34	7.1	90 TO 94
15	3.1	95 TO 99
24	5.0	100 TO 104
14	2.9	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




78
78
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(79)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1219 60 64 4 1
62 115200 480

60	60	60	61	68	60	60	62	60	62	71	60	64	62	63	60
60	69	62	85	97	99	87	89	90	84	85	79	79	80	81	81
95	101	94	94	95	95	98	93	96	93	93	95	96	90	89	90
94	85	73	74	60	60	60	60	60	60	60	63	60	60	60	60
60	65	60	60	60	60	60	60	60	60	60	60	60	60	60	60
65	78	64	67	71	66	76	60	61	69	66	60	60	60	60	60
60	60	60	60	60	60	60	63	64	60	60	60	60	60	60	60
68	72	60	73	66	62	60	64	60	60	61	63	61	61	63	60
79	75	65	63	74	67	60	68	61	61	61	61	60	70	65	67
60	62	60	65	60	60	60	60	67	62	63	63	63	66	70	60
60	60	60	61	60	60	86	80	85	66	62	69	63	63	61	60
60	60	60	72	63	60	70	67	67	61	60	60	60	84	101	104
65	80	102	81	74	63	92	75	76	61	70	75	61	62	66	74
78	66	71	75	72	68	63	67	64	75	80	89	68	76	67	64
69	74	65	60	60	86	99	97	97	101	108	100	87	99	61	71
74	92	79	81	75	74	91	69	60	60	60	60	60	62	60	60
60	60	60	60	60	60	64	63	68	60	60	60	64	65	80	65
65	60	60	68	63	71	60	60	61	65	60	60	60	60	60	60
60	60	64	65	60	63	64	63	67	62	60	67	77	90	65	71
60	101	99	99	100	103	93	62	60	68	67	74	61	63	60	61
69	61	61	76	76	60	74	95	87	94	96	96	86	60	60	80
98	90	94	62	63	91	88	89	82	88	99	73	72	98	91	93
100	73	70	60	60	60	60	60	60	60	60	60	60	60	76	91
62	60	60	62	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	62	63	62	62	71	74	92	60	60	60	60	60
60	60	60	78	61	63	70	60	72	60	60	73	66	60	60	88
90	60	60	60	60	60	60	60	60	60	60	65	60	60	72	60	60
60	94	91	80	80	84	82	94	60	65	68	60	60	72	90	90
88	87	65	61	60	60	60	61	60	79	72	67	84	92	84	66
71	78	76	79	74	64	91	92	88	90	90	95	94	91	89	93

(79)

ENTER LOG DATE (DD/MM/YR) : 22/08/79
ENTER SITE CODE (5 CHARS) : 33950
ENTER USER CODE (4 CHARS) : 4721
ENTER JOB CODE (3 CHARS) : 274

DATA LOGGED :22 AUG 1979
LOGGER : 08-301/26
SERIAL NUMBER : 1219
BAS LINE : 60 DB
A/D IC BASE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 0: 0: 0

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 33950
JOB CODE : 274
USER CODE : 4721
CHANNEL : 1
TOTAL SAMPLES = 115200
START AT : 0: 0: 0

TIME HISTORY ANALYSIS

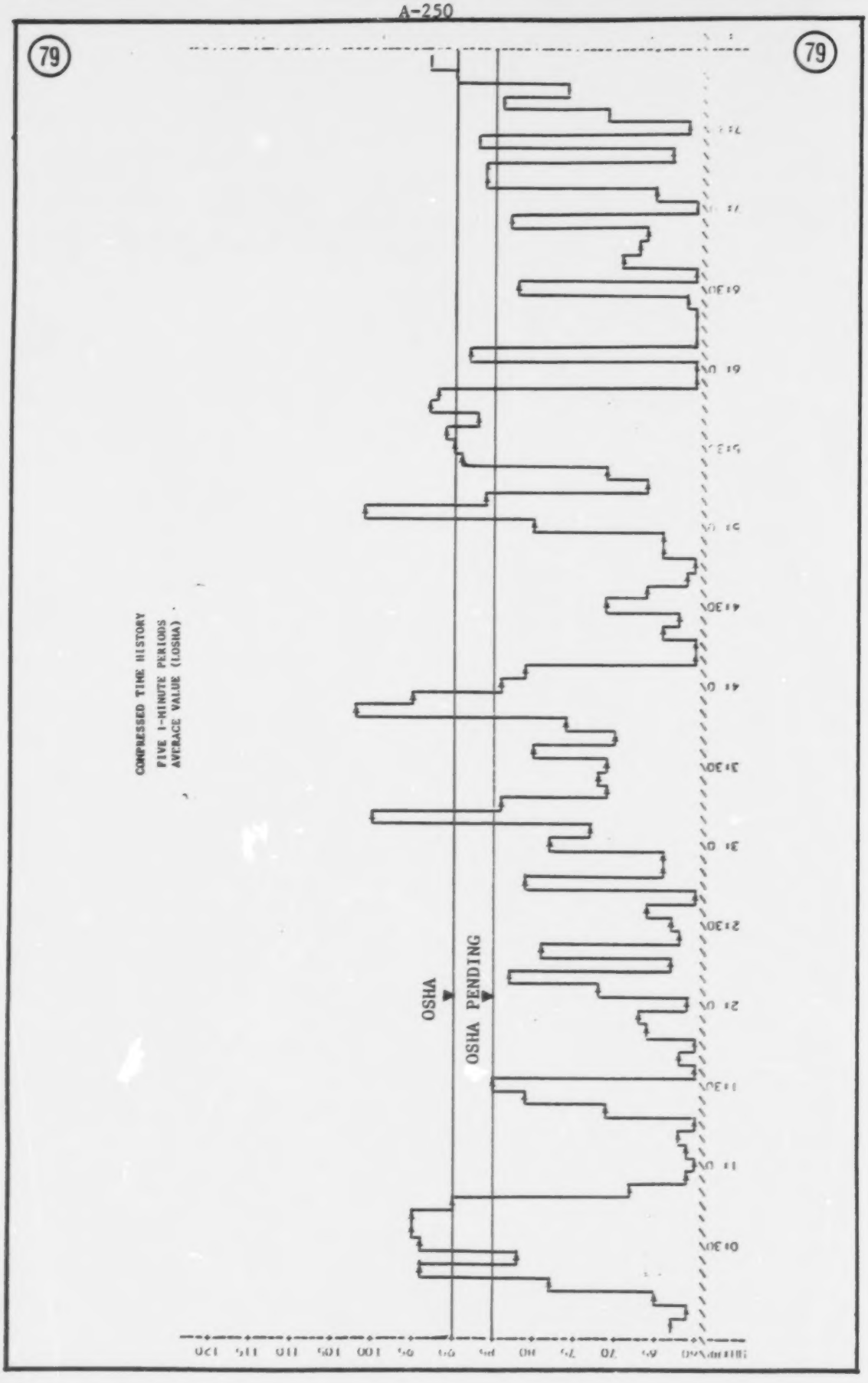
NOISE EXPOSURE INDEX (N.E.I.) CALCULATION
THE BASE IS THE HOURLY LEVEL
TOTAL TIME = 480 / 480
HOURLY (EQUIVALENT) LEVEL = 70 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

HOUR	LOGA CURRENT	LOGA CUMULATIVE	LINEAR CURRENT	LINEAR CUMULATIVE
1	86.1	86.1	9.546	9.55
2	76.2	83.9	1.089	10.61
3	72.6	81.6	1.160	11.77
4	90.2	84.9	12.683	24.40
5	71.7	83.6	.995	25.39
6	90.0	85.1	12.434	37.82
7	75.5	84.3	1.056	38.71
8	83.2	84.3	5.377	43.09

MIN. COMP. = 60 DB
MAX. COMP. = 104 DB
ARITHMETIC MEAN = 70 DB
STD. DEVIATION = 13 DB
VARIANCE = 169 DB

79 AMPLITUDE DISTRIBUTION 79

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
248	51.7	60 TO 64
49	10.2	65 TO 69
37	7.7	70 TO 74
25	5.2	75 TO 79
22	4.6	80 TO 84
26	5.4	85 TO 89
37	7.7	90 TO 94
25	5.2	95 TO 99
9	1.9	100 TO 104
2	.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		


79
79
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(80) PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN' (80)

1 26 80 1212 60 64 5 1
73H66 50762 211

63	60	64	62	60	63	60	60	61	63	63	71	68	64	60	61
60	60	60	60	60	64	60	65	61	60	62	60	60	60	60	62
81	82	82	82	97	101	90	89	84	85	82	93	74	74	73	87
90	89	95	73	60	60	60	75	76	60	60	77	61	60	60	60
60	60	60	60	60	60	60	60	60	60	60	61	60	60	60	60
80	78	68	76	65	67	63	66	63	60	66	65	69	73	68	69
62	71	76	78	62	66	69	73	60	61	73	67	60	60	60	65
60	60	60	60	60	60	60	60	60	60	60	60	62	62	66	66
71	60	60	60	60	61	65	66	69	64	67	60	60	60	60	60
60	60	60	60	60	60	60	60	60	64	69	62	72	85	98	92
74	60	67	61	61	60	61	60	72	62	64	60	60	68	68	64
63	62	65	65	67	68	60	60	73	63	60	65	71	60	60	60
60	60	60	60	60	60	60	60	61	62	61	60	60	60	63	60
60	60	61	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
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60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

%EOF

ENTER LOG DATE (DD/MM/YR) : 14/08/79
ENTER SITE CODE (5 CHARS) : 98034
ENTER USER CODE (4 CHARS) : 7845
[illegible] : MTH

DATA LOGGED :14 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1212
BASELINE : 60 DB
DYNAMIC RANGE : 54 DB
SAMPLING RATE : 4/SEC
TEST DURATION : 3:31:30

DATA ANALYZED : 21 SEPT 1979
SITE CODE : 98034
JOB CODE : [illegible]
USER CODE : 7845
THRESHOLD : 60 DB
TOTAL SAMPLES = 50762
STANDBY TIME = 5: 7846

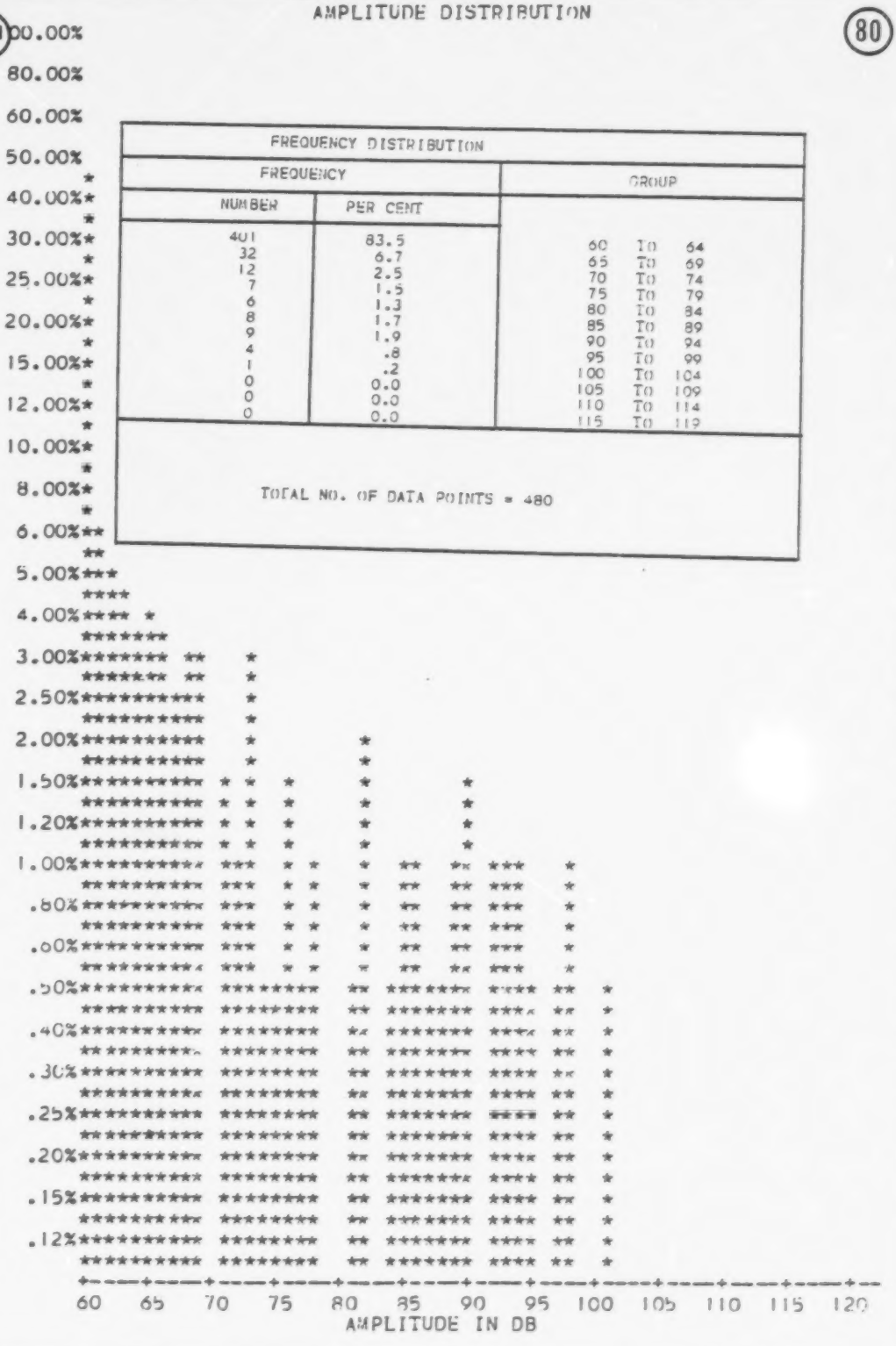
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF OCTAVE BANDS = 211
PERIOD = 1 MINUTES

TIME	LOSHA		DOSHA	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	63.9	63.9	5.496	5.40
2	75.0	80.8	1.508	6.97
3	73.9	79.1	1.330	8.30
4	62.9	78.1	.150	8.45

MIN. COMP. = 60 DB MAX. COMP. = 101 DB
ARITHMETIC MEAN = 66 DB
STD. DEVIATION = 10 DB
VARIANCE = 107 DB

AMPLITUDE DISTRIBUTION



FREQUENCY DISTRIBUTION

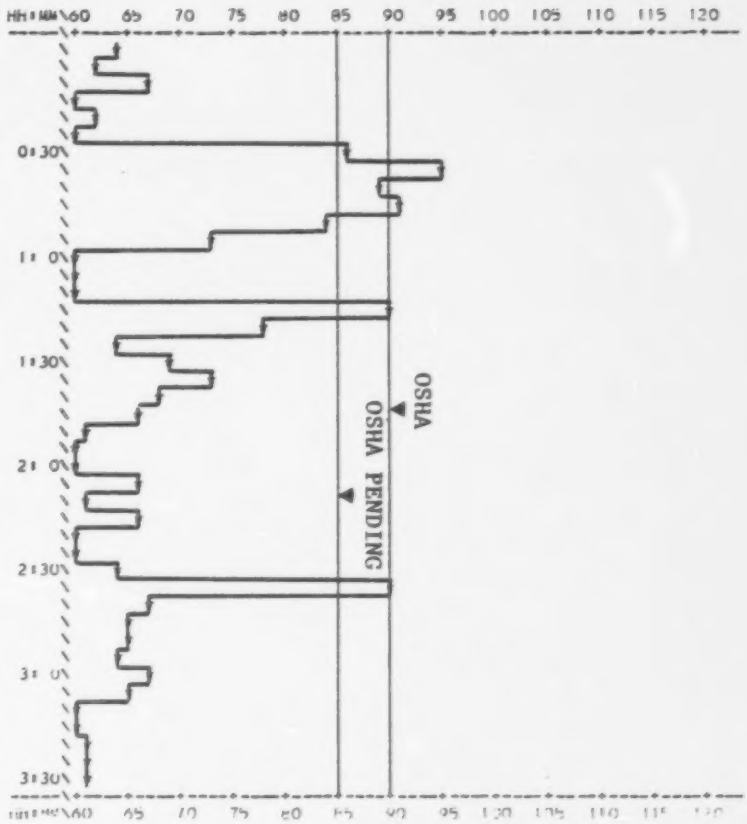
FREQUENCY		GROUP
NUMBER	PER CENT	
401	83.5	60 To 64
32	6.7	65 To 69
12	2.5	70 To 74
7	1.5	75 To 79
6	1.3	80 To 84
8	1.7	85 To 89
9	1.9	90 To 94
4	.8	95 To 99
1	.2	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480

80 80

COMPRESSED TIME HISTORY
FIVE 1 MINUTE PERIODS

AVERAGE VALUE (LOSHA)



(81)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1214    60    64     4     1
     732     115200   480
  60  60  60  60  60  61  66  60  60  62  60  60  60  60  66  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  66  76  60  70  83  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  87  83  76  60  60  60  60
  60  84  69  60  60  60  60  60  60  60  60  60  60  60  60  77
  83  84  65  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  67  70  80  66
  60 100 105  86  89  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  85  91  89  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  62  78  82  60  60  60  60  60  60  60  60  60  60  50
  60  60  60  60  66  65  74  74  82  79  69  65  60  60  60  62
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  81  63  60  60  60  60  60  60  60  60  60  60
  60  60  62  66  79  60  65  62  61  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  62  63  60  60  60  60  60
%EOF
```

(81)

```
ENTER LOG DATE (DD/MM/YR) : 24/08/79

ENTER SITE CODE (5 CHARS) : 00000
ENTER USER CODE (4 CHARS) : 4692

 ENTER JOB CODE (3 CHARS) : 273
```

```
   DATA LOGGED :24  AUG 1979                DATA ANALYZED : 25 SEPT 1979
        LOGGER : DB-301/26                      SITE CODE : 00000
 SERIAL NUMBER : 1214                           JOB CODE : 273
      BASELINE : 0.0 DB                         USER CODE : 4692
 DYNAMIC RANGE : 84 DB                          THRESHOLD : 60 DB
 SAMPLING RATE : 4/SEC                     TOTAL SAMPLES =  11520
 TEST DURATION =  48 HR  0 MIN            START TIME =  0 HR  0 MIN
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE LEVEL (PNL) CALCULATION
ARE BASED ON THE FOLLOWING:
LOG PERIOD = 1 MIN / 1 MIN
LOGGING OPTION = 0
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME HOUR	LEQ(A) CURRENT	LEQ(A) CUMULATIVE	% TIME CURRENT	% TIME CUMULATIVE
1	60.4	60.4	.205	.21
2	71.3	67.7	.934	1.14
3	60.0	68.9	.195	1.33
4	81.0	73.2	3.567	4.90
5	60.2	71.9	.201	5.10
6	66.2	71.2	.464	5.57
7	60.0	70.4	.195	5.76
8	63.3	69.8	.308	6.07

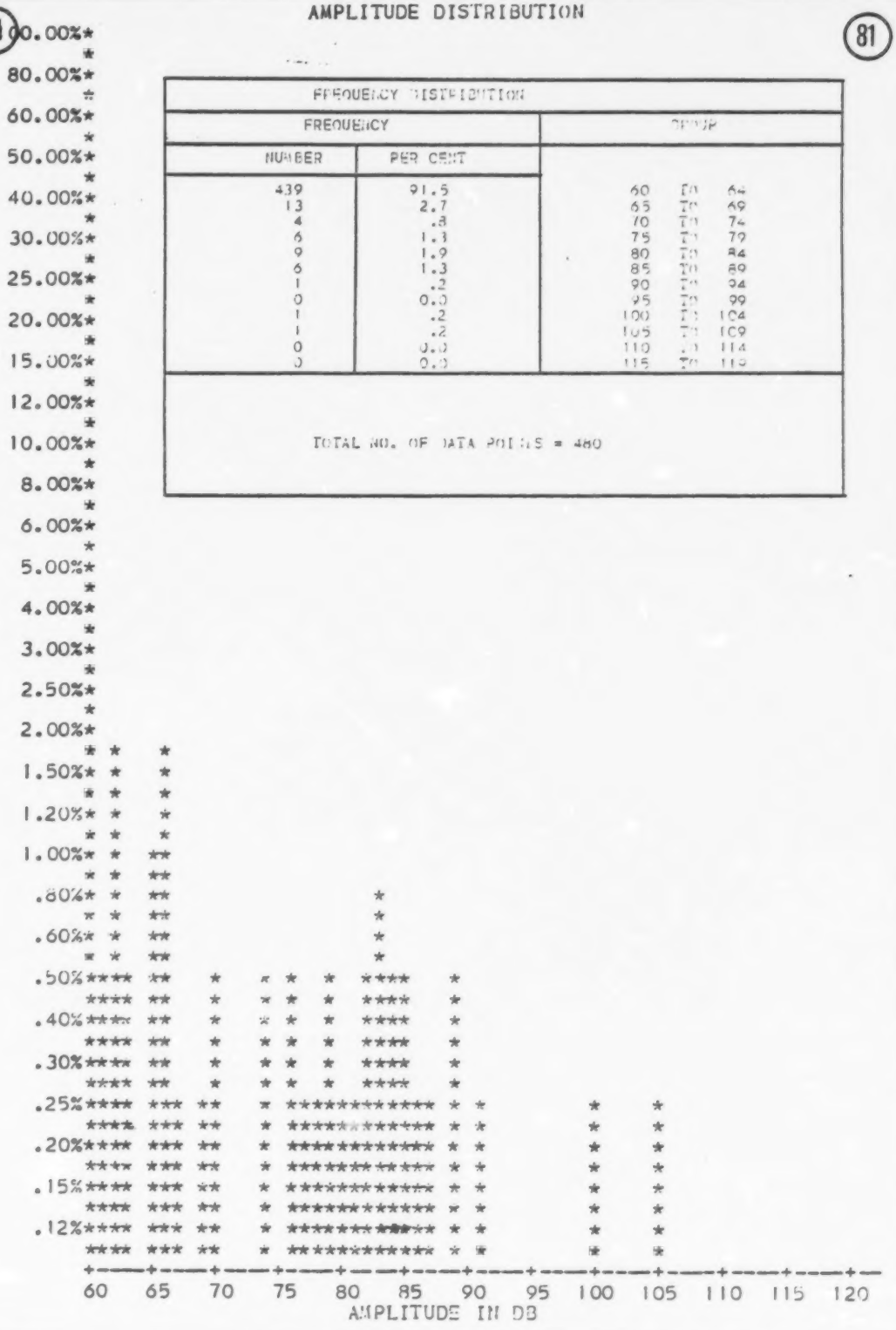
```
MIN. COMP. =  60 DB                    MAX. COMP. = 105 DB
ARITHMETIC MEAN =  61 DB
STD. DEVIATION =  6.5 DB
VARIANCE = 36 DB
```

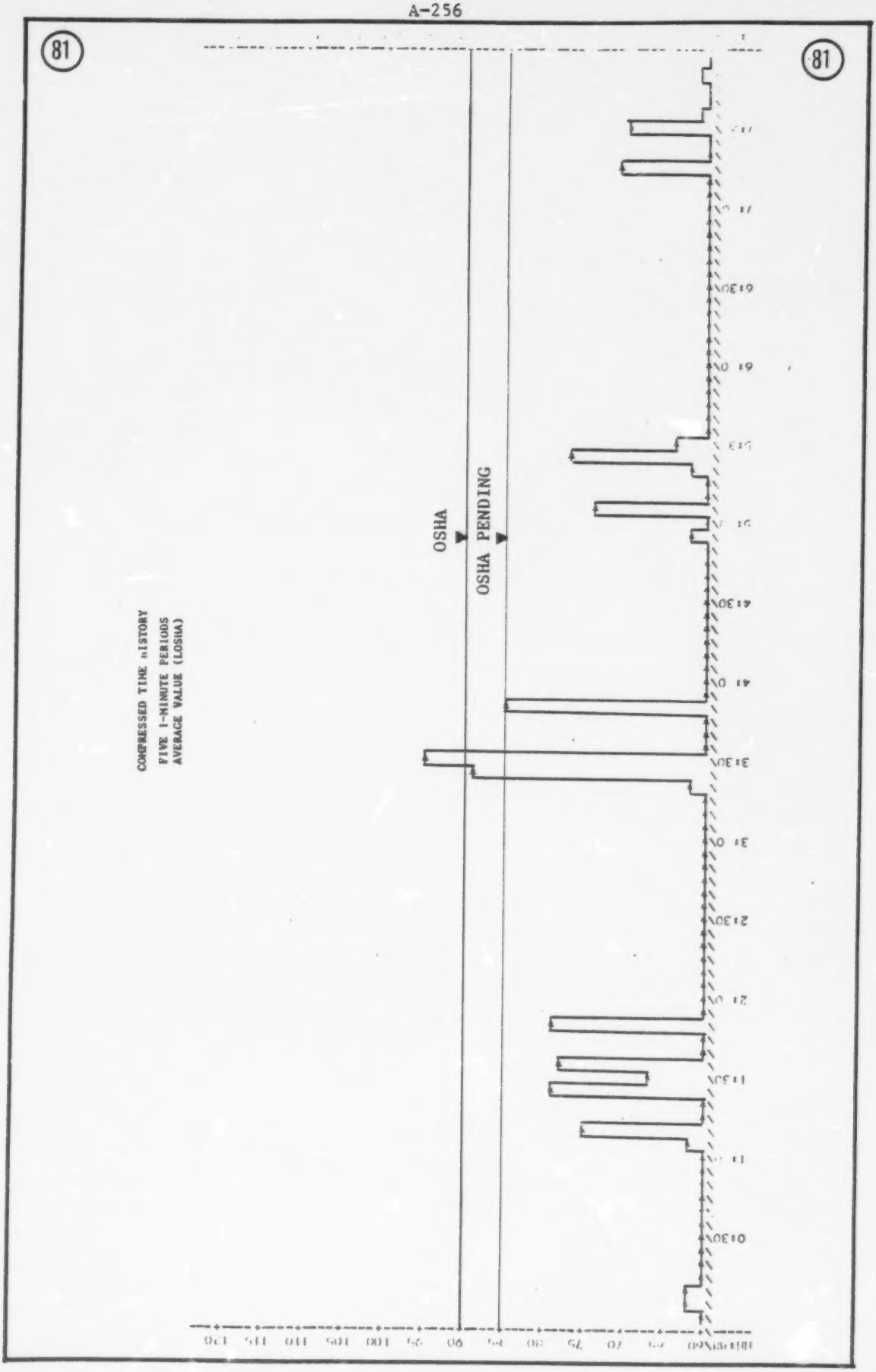
AMPLITUDE DISTRIBUTION

(81) (81)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
439	91.5	60 TO 64
13	2.7	65 TO 69
4	.8	70 TO 74
6	1.3	75 TO 79
9	1.9	80 TO 84
6	1.3	85 TO 89
1	.2	90 TO 94
0	0.0	95 TO 99
1	.2	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




81
81
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
0:30
1:30
2:30
3:30
4:30
6:30

(82)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(82)

```
  1  26  80  1212    60    64     4     1
     71      115200   480
  72  74  61  60  61  60  64  66  60  61  70  69  77  70  66  62
  62  69  58  64  77  69  70  72  67  70  72  60  74  72  66  76
  64  64  63  66  60  60  70  62  64  62  64  69  60  60  66  69
  73  67  63  81  80  60  62  60  68  71  81  60  60  60  60  60
  60  60  60  60  62  62  60  60  60  62  81  77  61  64  73  60
  60  60  60  60  72  70  71  88  87  60  60  64  60  60  60  60
  60  60  60  60  60  60  82  91  77  60  79  92  71  92  86  71
  82  74  60  72  71  60  60  60  60  60  74  75  60  70  93  86
  81  60  67  79  60  60  60  60  91  93  88  80  67  69  81  60
  60  60  60  60  74  60  60  60  60  60  60  60  60  60  60  60
  71  84  60  60  65  70  60  60  60  60  60  83  92  64  60  60
  60  60  74  80  85  87  78  95  80  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  78  60  60  60  60  72  62  61  60
  60  60  72  64  60  60  60  73  81  60  60  60  77  86  91 116
  95  82  60  60  90  90  91  94  76  60  60  60  72  60  60  60
  60  60  60  60  60  60  60  60  72  70  67  72  60  73  60  60
  60  71  60  60  60  85  60  60  60  60  60  60  60  82  85  86
  89  88  85  89  87  87  82  76  76  84  71  77  72  60  60  70
  77  60  71  60  93  85  60  60  60  76  78  78  83  81  84  73
  60  68  79  74  77  60  73  68  60  60  60  60  70  60  68  87
  93  92  73  77  86  66  68  90  86  93  77  60  75  60  75  78
  85  91  88  88  87  89  90  88  75  75  60  65  60  60  85  60
  60  60  60  60  60  60  60  60  60  64  69  89  86  64  79  85
  60  60  80  81  90  65  85  60  60  60  60  60  63  61  81  84
  68  60  66  90  62  72  85  61  63  68  73  77  81  70  71  76
  81  67  86  71  70  67  71  72  77  68  67  75  66  74  83  74
  75  71  63  60  60  70  60  60  60  67  91  90  68  63  79  73
  76  81  60  60  60  60  78  60  89  80  60  72  79  71  60  60
  60  62  60  60  60  60  60  61  87  78  60  60  60  60  60  60
  60  60  77  60  60  60  60  60  60  60  60  60  60  60  60  60
&EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : SCHST
ENTER USER CODE (4 CHARS) : 4734
 ENTER JOB CODE (3 CHARS) : 273
```

```
   DATA LOGGED :27 JULY 1979          DATA ANALYZED : 19 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : SCHST
SERIAL NUMBER : 1212                       JOB CODE : 273
     BASELINE : 60 DB                     USER CODE : 4734
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 0:17
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

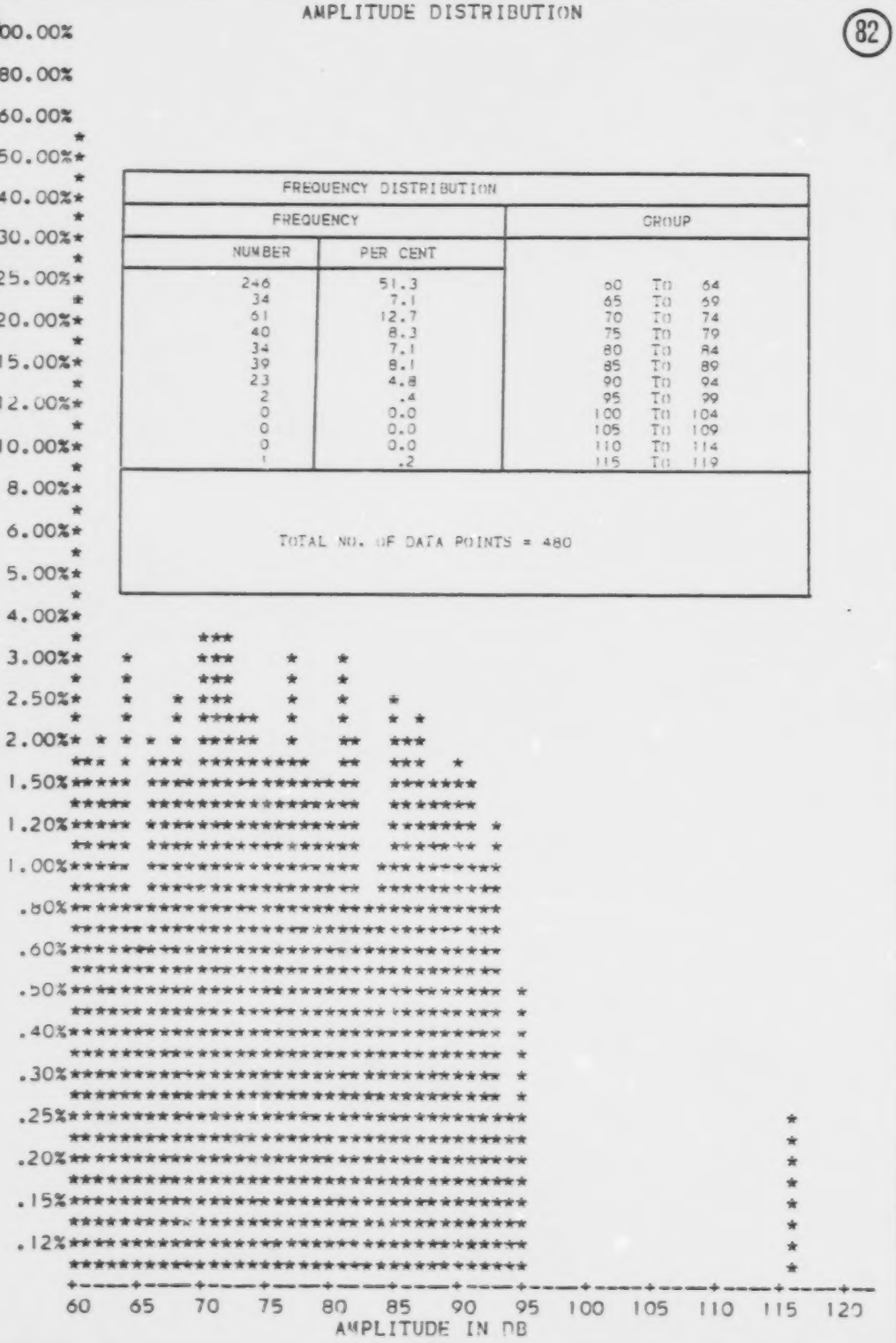
TIME	OSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	69.5	69.5	.728	.73
2	77.0	74.1	2.050	2.78
3	78.6	76.0	2.580	5.36
4	88.8	81.8	10.633	15.99
5	78.0	81.2	2.358	18.35
6	81.2	81.2	3.678	22.03
7	77.3	80.7	2.151	24.18
8	73.9	80.1	1.336	25.51

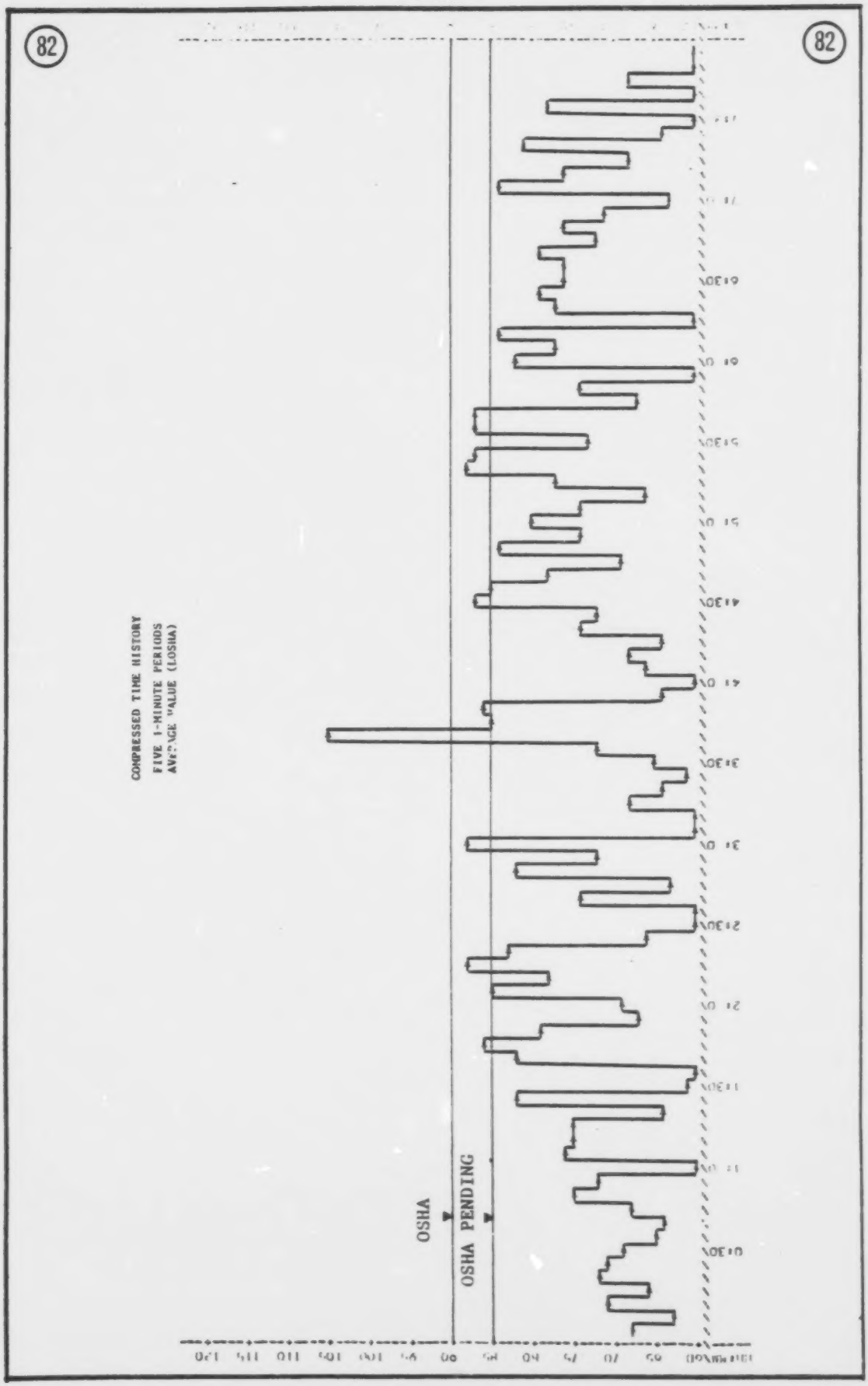
```
MIN. COMP. =  60 DB                MAX. COMP. =  116 DB
ARITHMETIC MEAN =  69 DB
STD. DEVIATION =  11 DB
VARIANCE =121 DB
```

82 AMPLITUDE DISTRIBUTION 82

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
246	51.3	60 TO 64
34	7.1	65 TO 69
61	12.7	70 TO 74
40	8.3	75 TO 79
34	7.1	80 TO 84
39	8.1	85 TO 89
23	4.8	90 TO 94
2	.4	95 TO 99
0	0.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
1	.2	115 TO 119

TOTAL NO. OF DATA POINTS = 480




82
82
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
65
70
75
80
85
90
95
100
105
110
115
120

(83)

(83)

[illegible]

ENTER LOG DATE (DD/MM/YR) : 13/01/10
ENTER SITE CODE (5 CHARS) : 00201
ENTER USER CODE (4 CHARS) : 4120

ENTER JOB CODE (3 CHARS) : 270

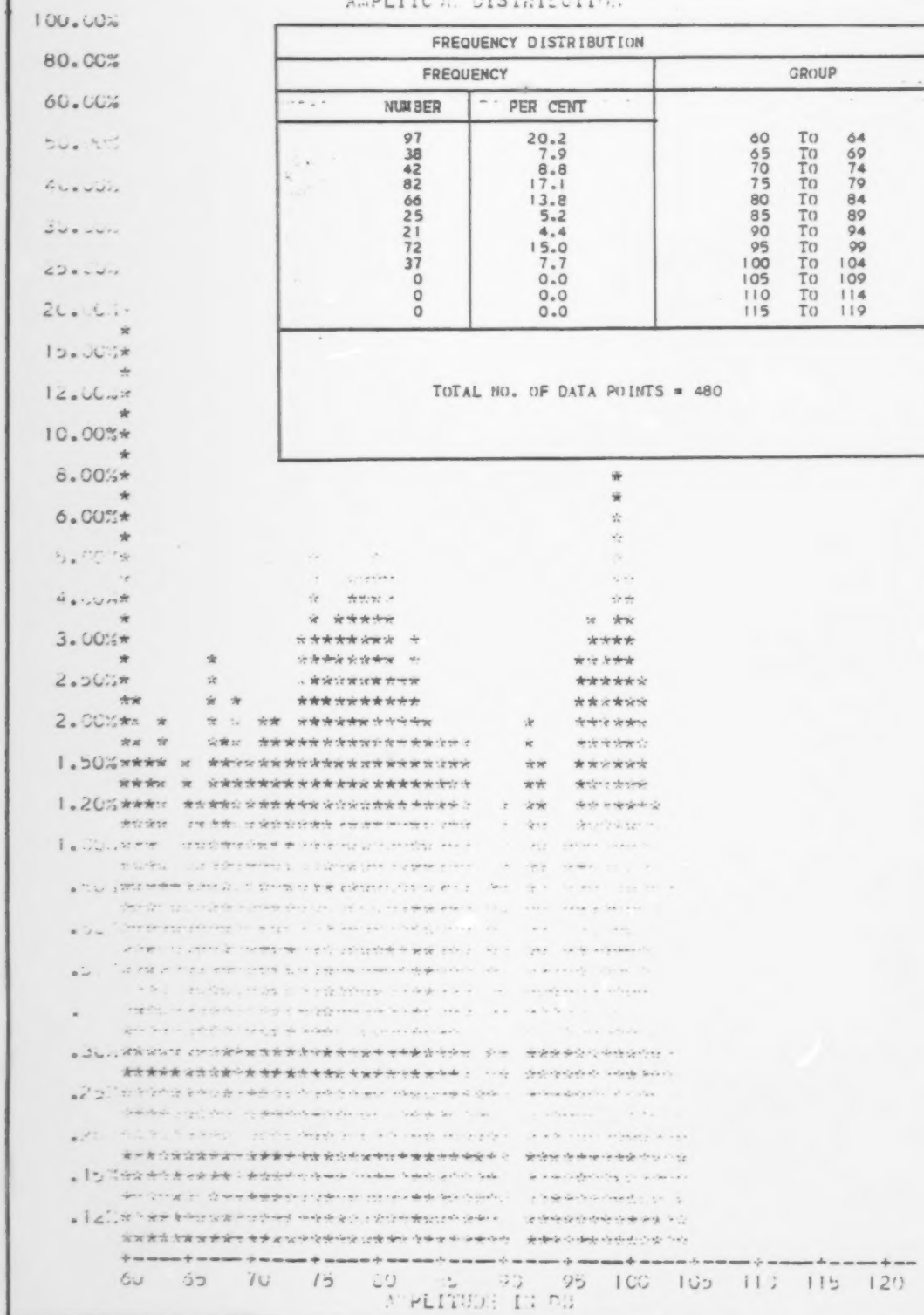
[illegible]

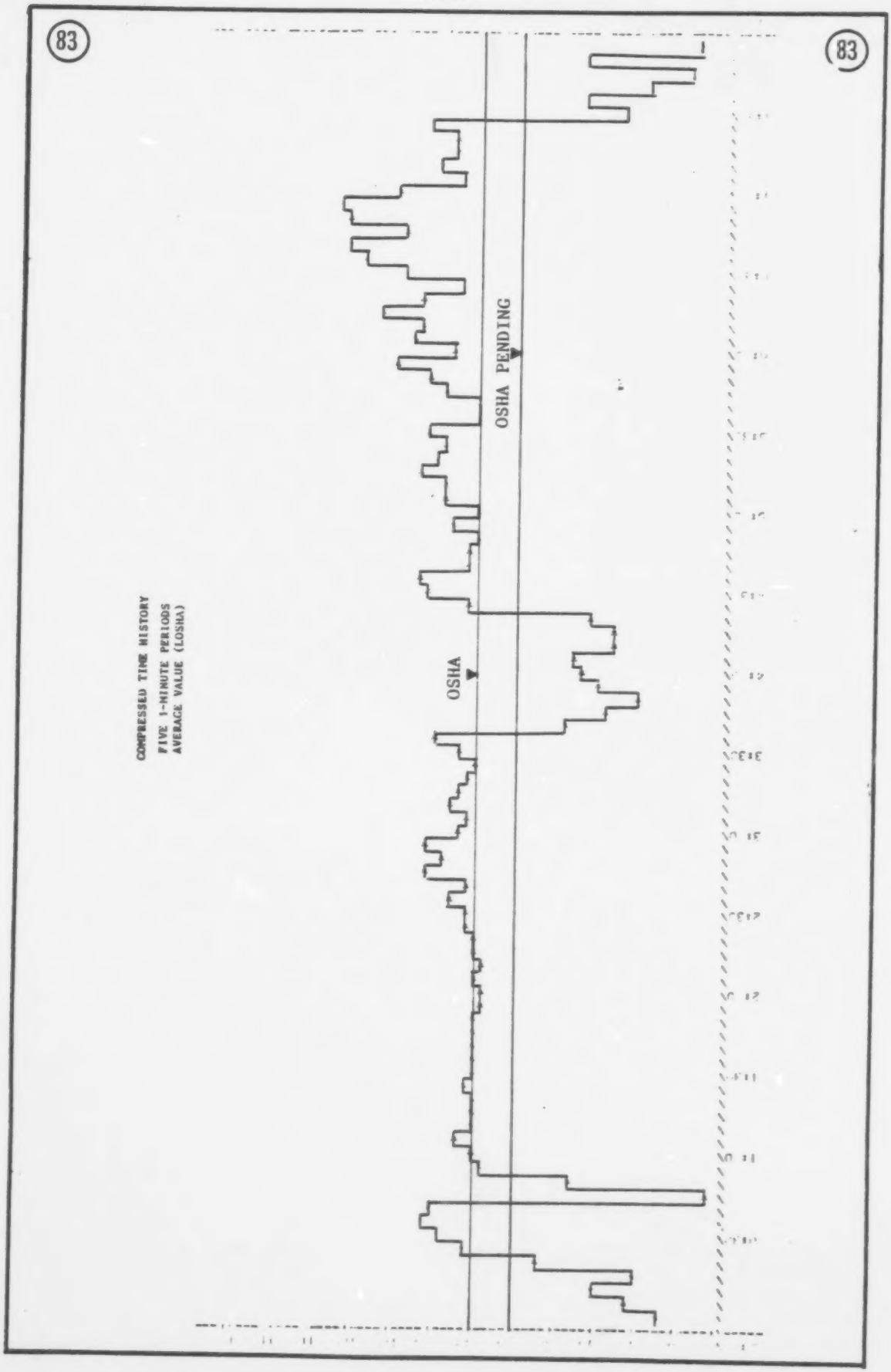
(83) (83)

AMPLITUDE DISTRIBUTION

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
97	20.2	60 To 64
38	7.9	65 To 69
42	8.8	70 To 74
82	17.1	75 To 79
66	13.8	80 To 84
25	5.2	85 To 89
21	4.4	90 To 94
72	15.0	95 To 99
37	7.7	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




83
83
OSHA PENDING
OSHA
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(84)

PLACE TAPE IN [illegible]
1 26 66 121 [illegible] 64 7 1
14080 11524 0 0
60 61 60 66 60 71 60 65 67 62 62 62 64 67 64 66
75 67 75 66 74 63 77 68 66 60 65 64 63 71 73 76
80 75 85 89 92 91 91 90 92 90 90 91 91 93 92 92
100 99 96 98 97 92 98 93 90 93 91 93 [illegible] 98 100
100 97 101 100 91 80 89 [illegible] 93 91 90 93 91 96 97 97
99 99 89 96 92 94 96 [illegible] 92 94 96 100 [illegible] 102 105
96 [illegible] 102 103 101 [illegible] [illegible] [illegible] 90 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] 1 1 [illegible] [illegible] [illegible] [illegible]
90 [illegible] 90 84 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
84 90 83 90 82 [illegible] [illegible] [illegible] 81 [illegible] [illegible] [illegible] [illegible] [illegible] 81 [illegible]
95 106 103 104 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
101 103 103 104 101 [illegible] [illegible] 101 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] 80 83 82 [illegible] 81 [illegible] 80 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] 81 81 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
96 99 90 96 100 [illegible] 103 102 [illegible] 102 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
100 102 97 [illegible] [illegible] [illegible] 102 104 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] 94 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
102 96 94 96 104 [illegible] 103 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
102 95 103 103 103 [illegible] 101 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
99 97 94 92 92 91 [illegible] 93 [illegible] 92 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
87 87 [illegible] 89 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] 91 [illegible] 84 [illegible] [illegible] [illegible] 81 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
60 61 60 62 64 60 60 60 60 60 60 60 60 60 60 61
62 61 64 62 65 60 62 61 60 61 60 60 64 60 62 65
63 64 60 60 60 60 61 61 61 60 60 60 60 60 60 60
60 60 62 60 69 66 61 68 68 65 62 67 61 60 65 69
64 63 63 62 77 71 [illegible] 73 75 64 69 69 [illegible] 63 61 69
63 63 65 60 62 62 61 66 60 60 64 60 63 63 60 60
65 60 62 66 62 69 67 92 95 92 95 93 95 91 94 96
EOF

(84)

ENTER LOG DATE (DD/MM/YR) : 10/07/79
ENTER SITE CODE (5 CHARS) : CC201
ENTER USER CODE (4 CHARS) : 4449

ENTER JOB CODE (3 CHARS) : 271

DATA LOGGED :10 JULY 1979 DATA ANALYZED : 11 [illegible] 1979
LOGGER : [illegible]-301/26 SITE CODE : CC201
SERIAL NUMBER : 1219 JOB CODE : 271
[illegible] : [illegible] USER CODE : 4449
[illegible] : [illegible] [illegible] :
[illegible] : [illegible] [illegible] = [illegible]
[illegible] = [illegible] :) [illegible] = [illegible]

[illegible]

[illegible] NUMBER INTEGRATION CALCULATIONS
[illegible]
[illegible] = [illegible]
[illegible] = [illegible]
[illegible] = [illegible]
[illegible] = [illegible]

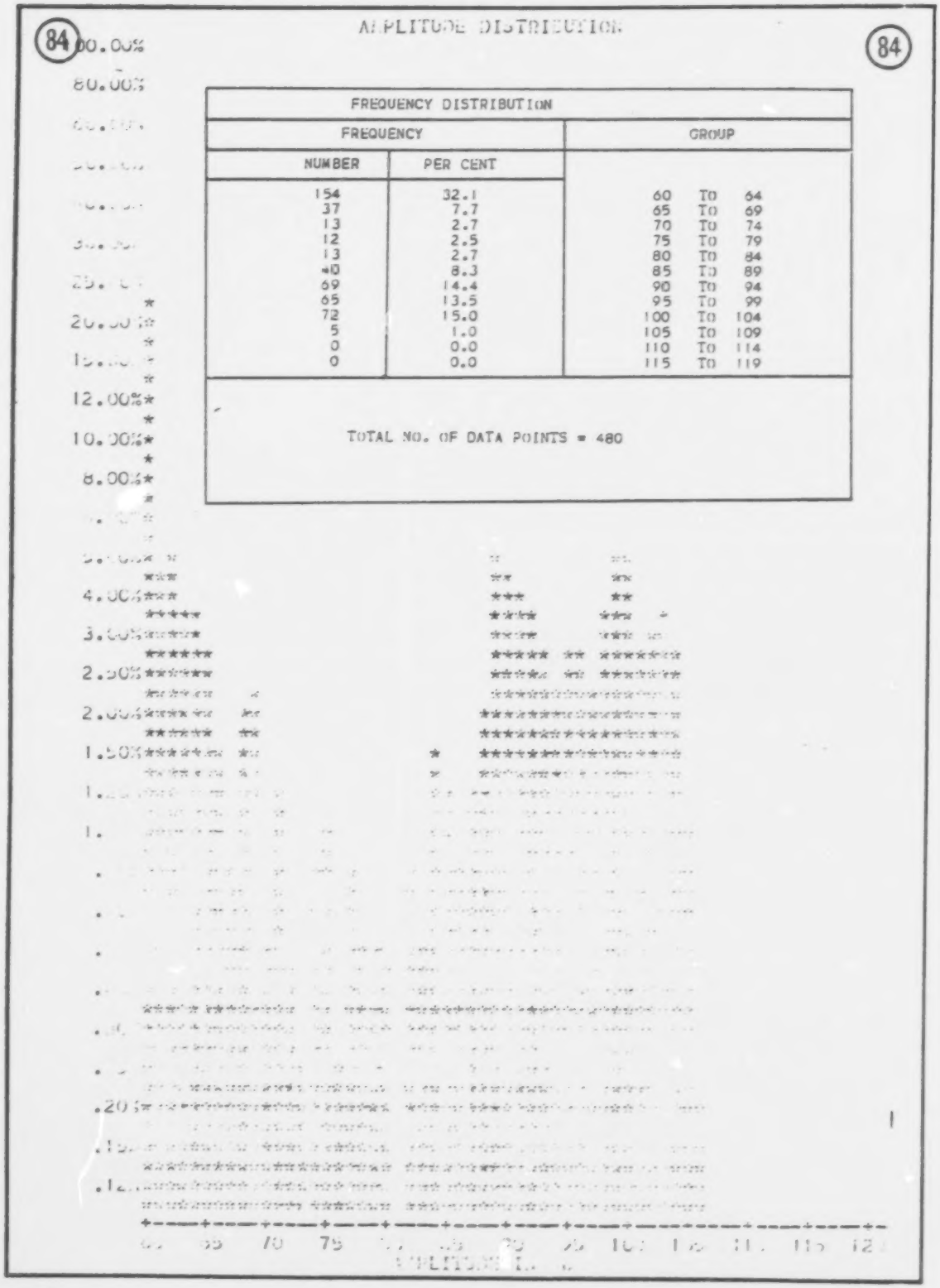
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]
3	92.5	93.2	17.69%	58.54
4	[illegible]	93.2	[illegible]	76.22
5	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]
7	81.2	83.8	.248	18.69
8	[illegible]	92.9	3.411	15.07

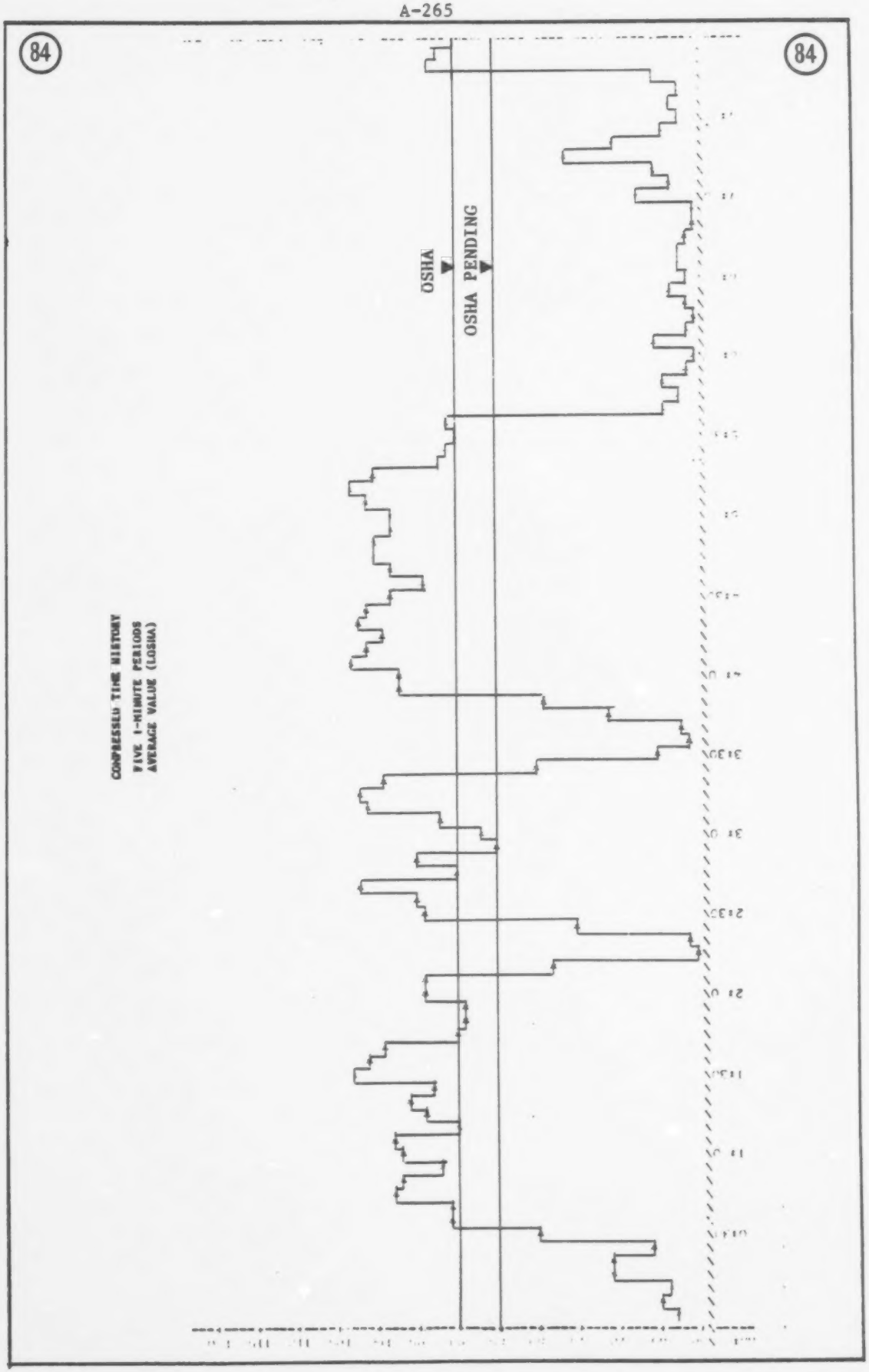
[illegible] = [illegible] [illegible] = [illegible]
[illegible]
[illegible] = 17

84 AMPLITUDE DISTRIBUTION 84

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
154	32.1	60 To 64
37	7.7	65 To 69
13	2.7	70 To 74
12	2.5	75 To 79
13	2.7	80 To 84
40	8.3	85 To 89
69	14.4	90 To 94
65	13.5	95 To 99
72	15.0	100 To 104
5	1.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




84
84
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(85)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1224    60   64    4    1
      74     115200  480
  63  67  62  60  68  60  60  55  67  68  75  64  75  62  78  77
  73  65  69  78  60  60  60  60  60  60  60  63  62  62  69  89
  73  69  70  73  69  69  83  73  74  81  75  75  82  91  96  91
  87  86  86  90  94  90  90  89  92  89  92  90  89  95  89  95
  96  92  92  82  97  92  92  92  93  86  67  60  60  60  60  60
  60  60  60  61  60  60  60  66  91  90  85  88  84  82  82  83
  75  71  67  81  79  81  83  81  81  81  81  81  81  81  81  81
  80  73  60  60  76  85  81  82  99 102  93 102  97  89  98 111
 107 105 108 110 103 110 107  93  92  93  94  96 100 100 101 107
 102 108 108 105 107 106 106 107 104  93  93  92  83  82  82  81
  82  81  82  81  82  82  81  80  81  79  78  83  71  80  81  81
  89  80  86  91  89  89  86  73  60  63  62  61  60  60  60  60
  60  60  67  60  63  60  60  60  60  60  60  60  70  63  72  64
  60  60  60  60  67  73  67  76  74  60  65  60  61  60  60  61
  61  60  60  61  77  62  61  63  66  73  69  79  80  85  82  85
  65  66  66  66  69  75  84  70  60  60  65  70  71  76  90  95
  84  60  60  60  86  94  86  87  74  60  71  82  90  98  99  95
  88  95  94 104 101 103 103 105  98  98  95  95  94  95  98  95
 103 101  94 101  97  87  91  99  98  98  93  90  93 100  99 102
  94  88 103 106 100  89 103 108 105 107 106 105 106 105 104  91
  92  94  92  95 101 104 101 103 102 107 105 108 104 108 106  99
  91  92  96 102 101 102 103 103 106 104 108 104 105 105 101  91
  98  93  97 102 102 103 102 103 103 105 108 105 106 106  94  92
  94  94  93 104  90 101 105 104 106 104 102 105 105 105 104  94
  92 104 103  99  99 101 103 103 103 106 114 106 105 107 106 103
  93 101 101  91  93 100 103 104 105 105 108 106 107 105 107 106
 100  93  92  82  60  73  75  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  63  75  60  62  64  72  60  60  60  60
  60  60  60  60  60  60  60  60  61  60  67  67  67  60  56  61
  65  70  62  60  60  67  94 101  95  97  97  96  97  60  60  60
%EOF


ENTER LOG DATE (DD/MM/YR) : 23/07/79

ENTER SITE CODE (5 CHARS) : ISHAF

ENTER USER CODE (4 CHARS) : 7721
 ENTER JOB CODE (3 CHARS) : 270


   DATA LOGGED :23 JULY 1979          DATA ANALYZED : 17 SEPT 1979
        LOGGER : JB-301/24                 SITE CODE : ISHAF
 SERIAL NUMBER : 1224                      JOB CODE : 270
      BASELINE : 60 DB                     USER CODE : 7721
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC             TOTAL SAMPLES = 115200
 TEST DURATION =   8  H  0                STARTED AT = 21 0819

            TIME HISTORY ANALYSIS

 NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
 ARE BASED ON THE FOLLOWING
 100% DOSE = 9  DB / 8 HRS
 EXCHANGE (DOUBLING) RATE = 5 DB
 THRESHOLD (CUTOFF) LEVEL = 80 DB
   NUMBER OF COMPUTATIONS = 480
 PERIOD =  1 MINUTES

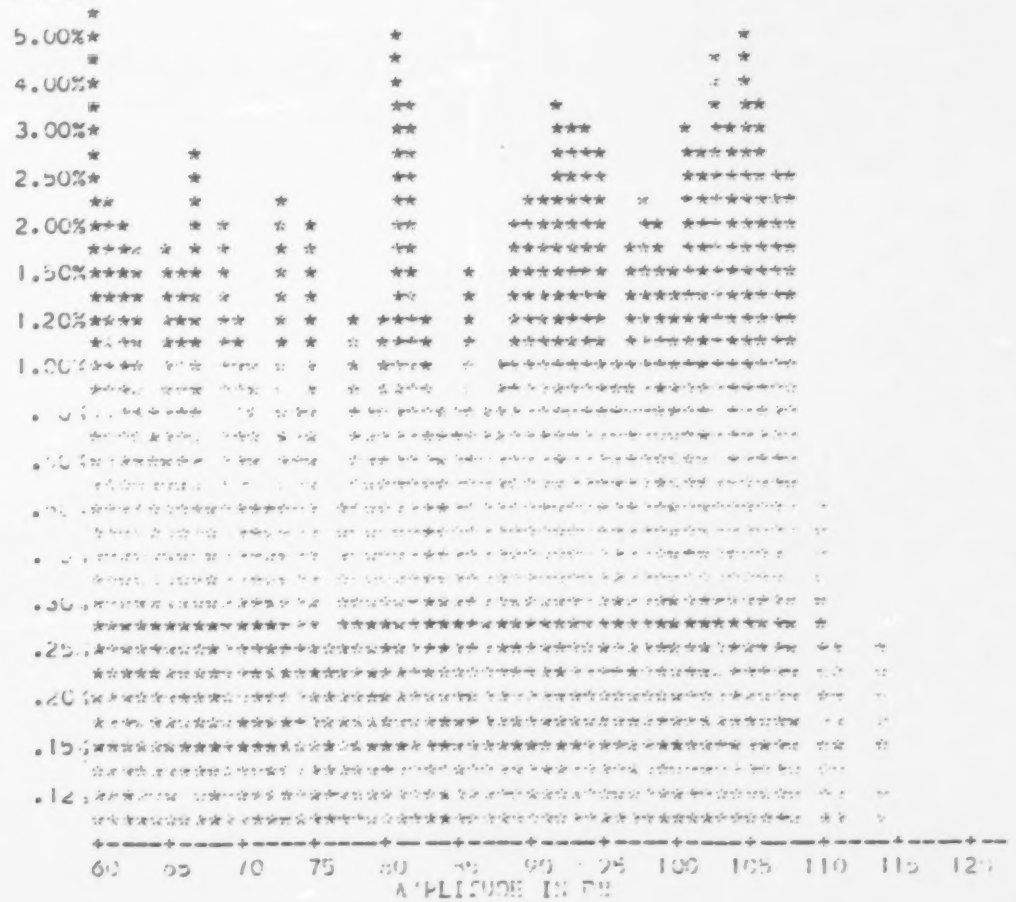
 TIME          LOGIA                        DOSE
 HOUR     CURRENT  CUMULATIVE        CURRENT  CUMULATIVE
    1        82.4        82.4          4.335        4.34
    2        85.1        83.9          6.358       10.69
    3       100.3        93.7         52.087       62.78
    4        72.9        91.8          1.172       63.95
    5        94.1        92.3         22.111       86.06
    6       102.4        95.3         70.131      156.19
    7       103.4        97.2         79.696      235.89
    8        82.5        96.3          4.441      240.33
 MIN. COMP. =  60 DB                MAX. COMP. =  114 DB
 ARITHMETIC MEAN =  83 DB
 STD. DEVIATION =  17 DB
 VARIANCE =284 DB
```

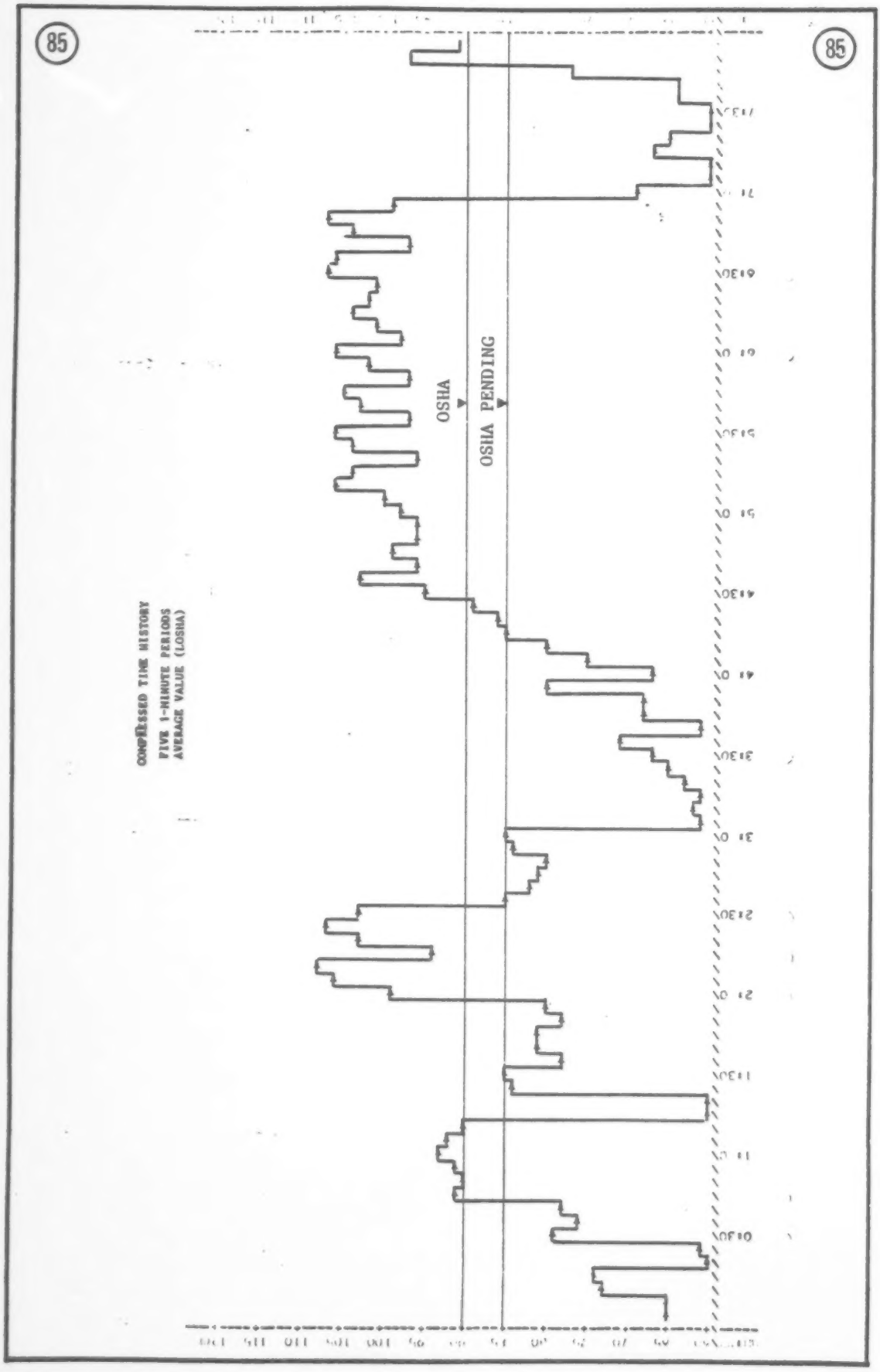
(85)

AMPLITUDE DISTRIBUTION

(85) (85)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
117	24.4	60 TO 64
34	7.1	65 TO 69
23	4.8	70 TO 74
19	4.0	75 TO 79
47	9.8	80 TO 84
24	5.0	85 TO 89
59	12.3	90 TO 94
39	8.1	95 TO 99
61	12.7	100 TO 104
53	11.0	105 TO 109
4	.8	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




85
85
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(86)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1219   60   64    A    1
      79     115200  480
  65  65  61  62  60  61  64  60  60  61  60  60  60  62  62  60
  60  65  67  60  60  60  60  74  62  60  60  60  62  60  60  60
  61  60  60  60  61  68  60  69  67  71  65  60  62  62  60  71
  74  77  80  70  82  89  88  89  89  90  90  90  90 102 101  99
 101 100 100 101 102 101  97  98  94  99  96  98  99  98  99  96
  82  70  81  78  80  80  80  80  80  80  81  80  80  81  81  81
  82  81  81  81  64  60  60  60  79  81  81  81  81  80  81  71
  60  64  76  75  74  72  66  70  64  60  60  60  71  72  67  63
  63  67  60  60  81  81  81  81  81  81  81  80  78  75  64  81
  82  81  81  81  81  80  81   1  81  81  81  81  81  81  81  81
  81  81  80  69  81  81  81  81  81  81  81  81  81  81  81  81
  81  81  81  81  81  81  81  81  81  81  81  80  81  81  81  81  81
  81  81  81  81  81  82  81  81  81  81  81  81  82  82  81  82
  81  81  81  76  64  67  72  63  73  72  63  60  60  60  70  91
  87  67  64  73  60  60  68  66  60  60  60  60  60  61  60  60
  83  60  60  60  60  77  82  82  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  64  60  62  60  60  62  61  60  60  60  63  60
  60  60  60  60  64  85  92  94  91  82  75  66  66  64  72  71
  69  65  69  73  64  63  60  81  68  73  60  60  63  60  62  66
  68  68  77  80  77  74  62  60  60  65  74  77  65  89  97  96
  91 100  96  83  66  82  60  64  64  81  88  93  90  94  93  90
  81  61  60  66  60  60  66  85  92  94  96  98  96  99  94  94
  84  86  88  88  88  89  68  71  74  82  82  84  86  81  80  60
  60  60  60  61  60  68  80  82  84  14  84  84  84  80  82  81
  82  81  81  82  83  81  79  76  81  80  83  83  72  75  80  77
  77  81  77  72  75  72  64  77  66  61  78  73  65  64  68  71
  67  69  67  69  71  70  69  70  71  70  68  66  66  60  60  63
  73  66  66  62  67  67  62  76  75  76  79  90  60  61  68  61
%EOF
```

(86)

```
ENTER LOG DATE (DD/MM/YR) : 23/07/79

ENTER SITE CODE (5 CHARS) : CC204
ENTER USER CODE (4 CHARS) : 2855
 ENTER JOB CODE (3 CHARS) : 270
```

DATA LOGGED :23 JULY 1979
LOGGER : DL-301/20
SERIAL NUMBER : 1217
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 HRS 0 MIN

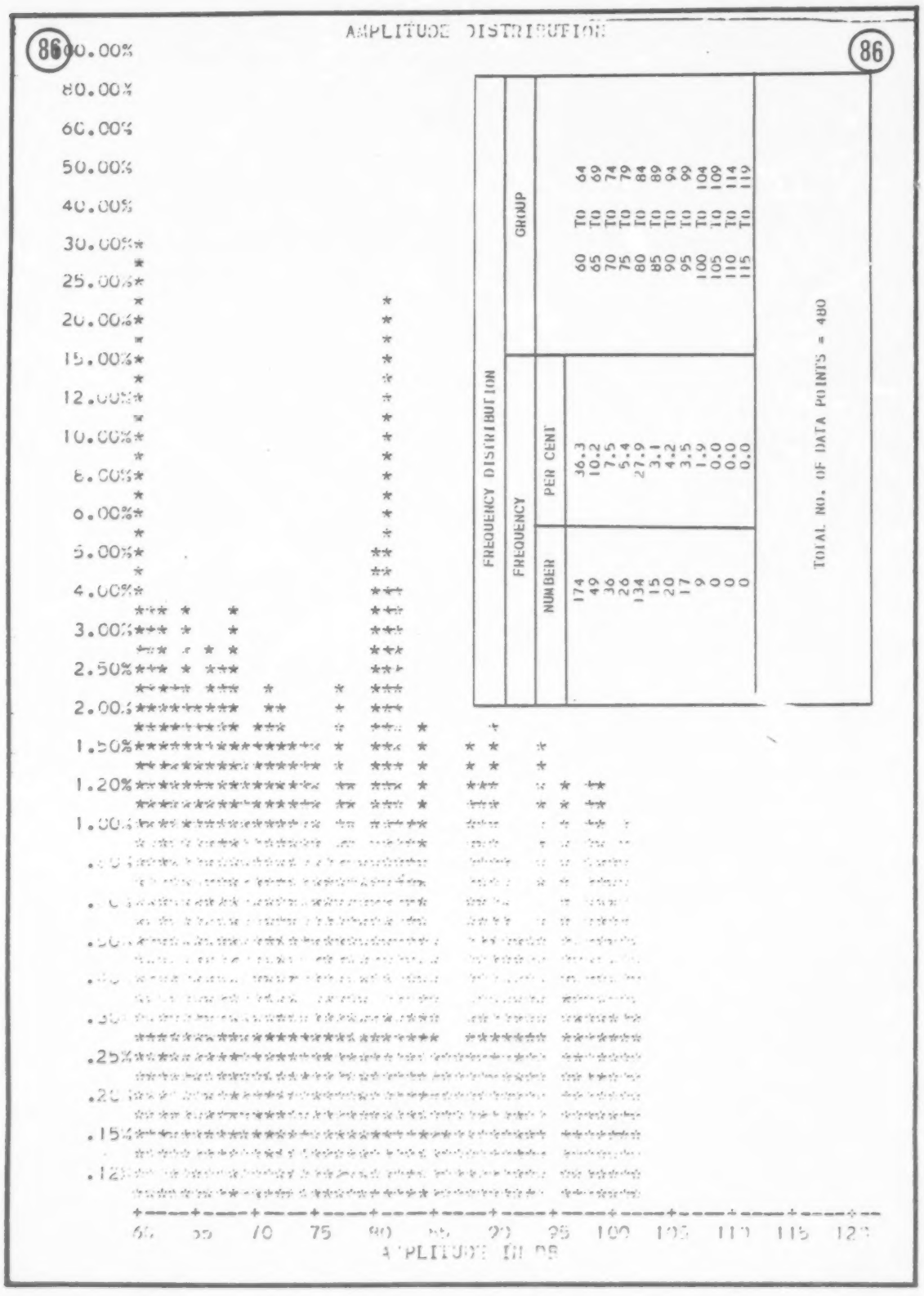
DATA ANALYZED : 17 SEPT 1979
SITE CODE : CC204
JOB CODE : 270
USER CODE : 2855
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STARTUP TIME = 0 HRS 0 MIN

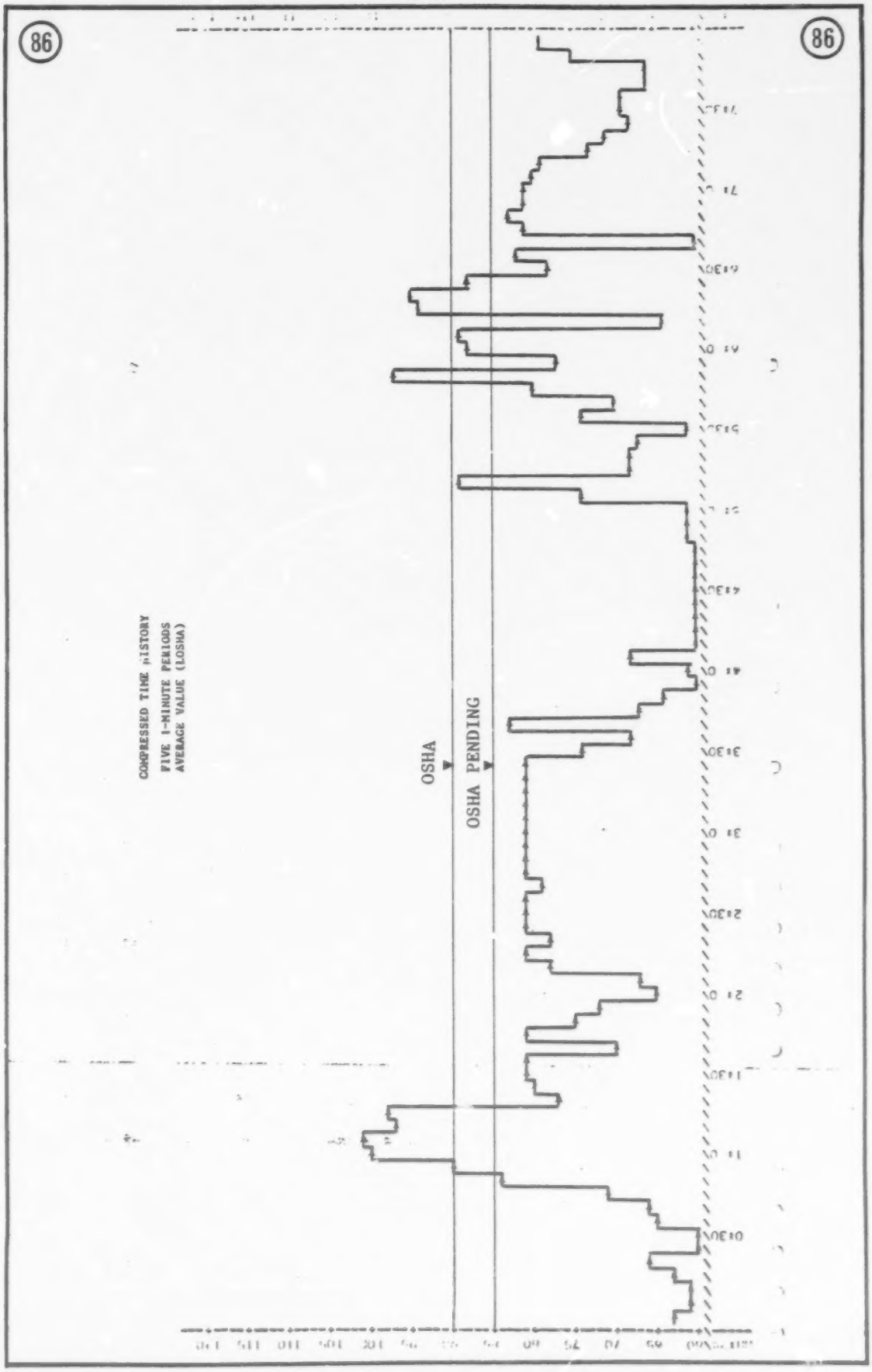
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
LOGIC LEVEL = 80 DB / 4 DB
SATURATION (SPILLING) LEVEL = 144 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIC		SPACE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	75.9	75.9	1.767	1.77
2	41.9	67.6	16.167	17.93
3	77.2	70.7	2.797	20.72
4	78.3	74.5	2.475	23.19
5	61.3	62.9	.239	23.43
6	82.8	69.9	4.589	28.03
7	86.1	73.6	1.729	29.77
8	74.9	82.9	1.537	37.93

MIN. COMP. = 60 DB MAX. COMP. = 102 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 12 DB
VARIANCE =144 DB


AMPLITUDE DISTRIBUTION
86
86
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
60 TO 64
65 TO 69
70 TO 74
75 TO 79
80 TO 84
85 TO 89
90 TO 94
95 TO 99
100 TO 104
105 TO 109
110 TO 114
115 TO 119
174 36.3
49 10.2
36 7.5
26 5.4
134 27.9
15 3.1
20 4.2
17 3.5
9 1.9
0 0.0
0 0.0
0 0.0
TOTAL NO. OF DATA POINTS = 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.25%
.20
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


86
86
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(87)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
1 26 80 1216 60 64 4 1
114 115200 480

60	60	60	60	60	63	68	60	60	60	60	61	67	63	64	75
70	81	78	81	80	75	77	77	77	76	79	78	78	93	95	90
98	91	83	85	85	85	90	91	92	91	91	86	88	96	87	83
76	85	88	88	76	69	65	70	64	63	63	65	66	68	75	81
75	74	65	68	70	69	76	70	82	64	82	90	93	90	84	91
98	103	101	101	97	94	95	94	93	96	94	95	94	93	94	93
88	91	97	92	101	105	102	105	103	99	98	106	102	104	104	104
95	99	104	104	100	105	103	101	104	103	103	99	105	103	103	96
94	94	94	94	95	94	99	102	95	93	90	92	93	94	94	93
94	95	93	94	96	107	102	103	104	100	101	104	101	100	99	102
102	100	101	99	99	100	99	101	99	99	99	99	95	94	94	96
94	93	100	102	97	94	89	72	90	93	94	94	97	104	100	106
106	103	105	103	102	101	101	98	103	101	105	104	95	94	94	97
100	95	104	93	95	95	100	100	104	103	97	96	103	103	99	107
104	101	100	87	96	104	101	104	102	101	100	102	101	101	100	99
101	101	106	105	105	105	104	103	100	96	94	94	95	93	93	95
93	94	92	94	95	94	104	101	105	105	100	99	100	100	106	103
101	99	101	101	101	101	101	102	106	108	103	94	99	109	106	102
97	95	96	60	66	60	60	60	60	60	60	60	60	60	61	60
60	60	60	65	61	60	60	60	60	60	61	61	60	60	60	61
61	67	62	65	62	88	95	94	92	94	103	104	106	104	106	102
101	101	107	109	109	107	103	104	109	107	102	102	106	109	106	97
93	104	98	104	107	105	100	95	95	96	96	94	105	108	98	101
100	104	103	101	104	101	99	98	101	99	99	101	106	103	102	105
103	104	103	101	95	96	95	95	95	93	94	94	97	100	107	104
102	102	105	106	106	102	84	75	92	95	94	63	60	66	80	103
99	104	102	105	100	104	103	107	97	99	103	98	95	95	94	94
97	95	107	101	109	105	102	111	111	110	105	104	103	102	102	108
101	101	104	104	102	105	110	108	107	108	111	111	103	96	95	95
95	76	67	64	67	70	72	60	61	71	81	84	83	90	91	92

$EOF

ENTER LOG DATE (DD/MM/YR) : 21/08/79
ENTER SITE CODE (5 CHARS) : 32950
ENTER USER CODE (4 CHARS) : 7720
ENTER JOB CODE (3 CHARS) : 281

DATA LOGGED :21 AUG 1979
LOGGER : DB-301/26
SERIAL NUMBER : 1216
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 HR 0 M

DATA ANALYZED : 25 SEPT 1979
SITE CODE : 32950
JOB CODE : 281
USER CODE : 7720
THRESHOLD : 90 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0 HR 0 M

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOG TIME = 8.0 / = HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 90 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LEQ(A)		EXPOSURE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	84.1	84.1	5.510	5.51
2	97.5	93.5	35.234	40.75
3	99.2	93.9	54.300	95.05
4	100.5	97.4	53.782	139.33
5	100.1	98.0	51.040	190.37
6	99.9	98.4	49.143	239.51
7	100.6	98.7	54.490	294.00
8	102.5	99.3	70.238	364.24

MIN. COMP. = 60 DB MAX. COMP. = 111 DB
ARITHMETIC MEAN = 92 DB
STD. DEVIATION = 15 DB
VARIANCE =225 DB

(87)

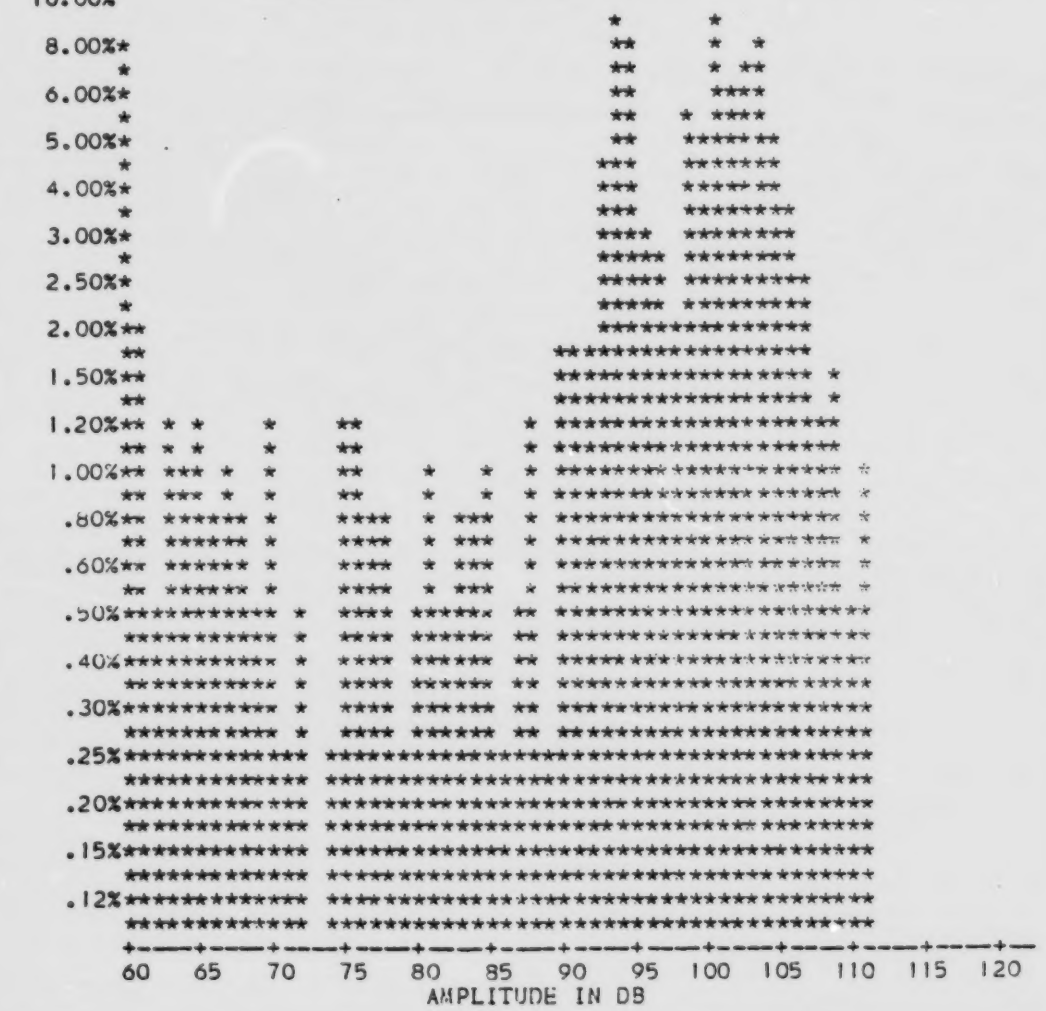
87

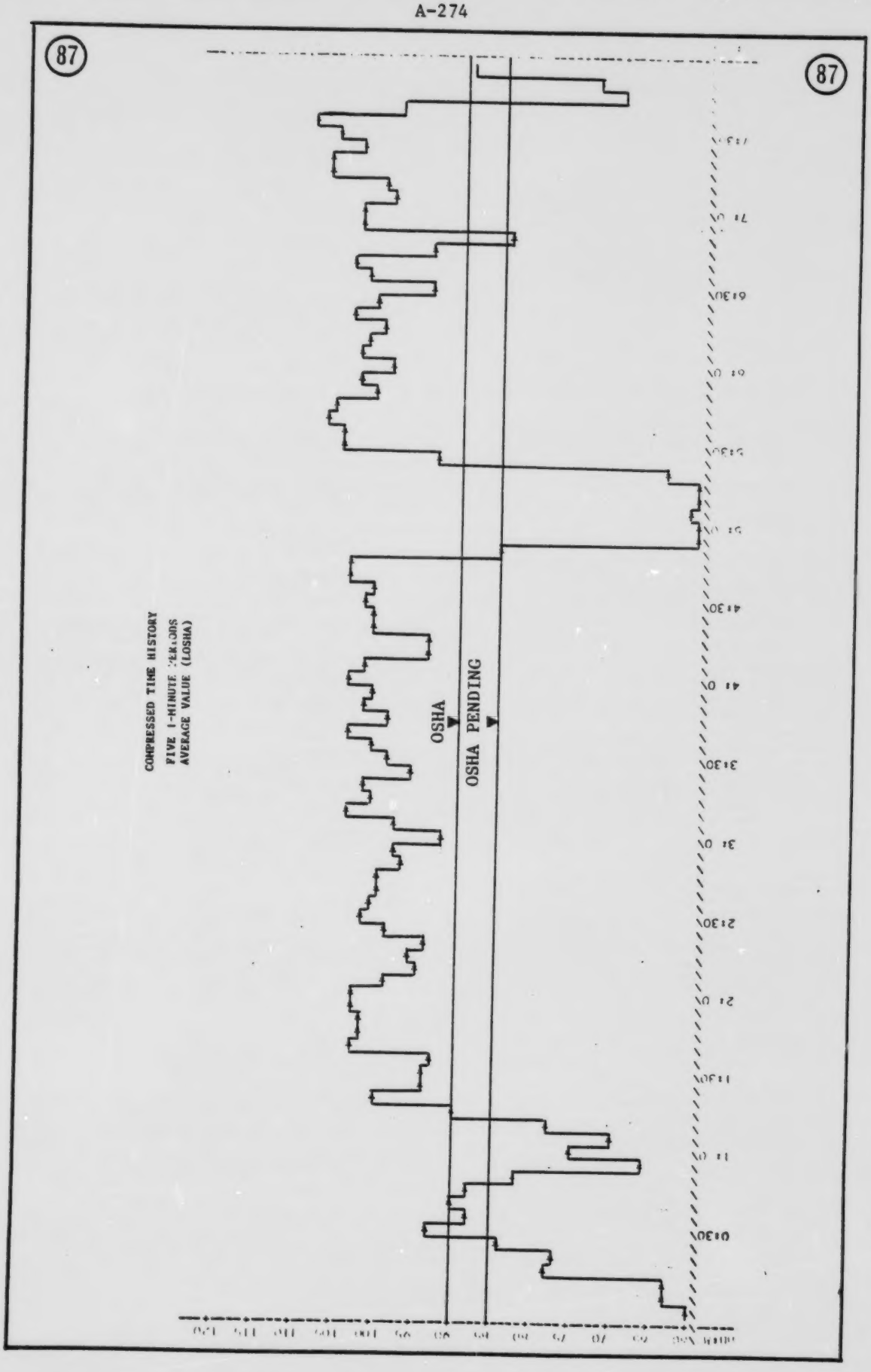
AMPLITUDE DISTRIBUTION

87

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
52	10.8	60 TO 64
17	3.5	65 TO 69
9	1.9	70 TO 74
17	3.5	75 TO 79
14	2.9	80 TO 84
13	2.7	85 TO 89
74	15.4	90 TO 94
84	17.5	95 TO 99
140	29.2	100 TO 104
54	11.3	105 TO 109
6	1.3	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




87
87
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30

(88)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1225    60    64     4     1
     134     115200   480
 65  78  72  65  73  77  78  74  47  78  89  90 100  99 100 100
 99  92  91  93  96 100  98  97  99  98  97  99 100  97  98  98
 97  98  97  90  72  70  60  60  61  60  63  76  74  62  68  70
 71  81  88  93  95  84  64  61  64  64  67  67  61  63  67  60
 60  60  63  60  60  60  60  60  63  60  60  64  61  61  77  66
 64  60  61  60  62  63  67  60  63  60  65  67  61  60  66
 60  60  66  73  67  60  64  65  69  63  70  71  66  68  63  69
 60  64  71  66  62  65  66  71  65  63  73  71  70  65  67  71
 91  84  71  66  67  62  67  66  73  61  75  72  67  70  68  68
 81  78  80  80  77  79  84  73  75  85  85  82  80  81  80  80
 79  82  82  82  85  85  87  82  82  84  82  87  87  87  87  86
 85  85  87  87  89  90  89  90  89  89  90  92  93  87 101 102
104 104 105 104 105 104 103 101  97  92  93  94 103  94  94  93
 94  90  92  89  93  91  90  93  93  92  90 100  97  94  95  97
 96  90  91  92  92  94  92 107 110 110 109 111 111 110 112 111
106  95  90  98 108 116 116 113 113 110  91  98 103 103 110 112
113 114 108  91  90  92  90  91  90  90  91  92  92  89  89  90
 91  91  91  91  90  90  89  90  91  91  90  89  90  90  90  90
 90  88  89  85  91  88  87  92  90  90  87  86  86  92  92  88
 99 100 100 100 100 100 100 100 101 101  99  95  93  88  99  98
 94  93  97  86  85  88  92  91 110 110 110 108 107 107 101  88
103 107 108 107 106 105 107 100  85  85  85  92  93 106 108 106
 84  85  74  76  73  82  82  84  87  90  86  79  86  87  87  85
 95 108 107 107 103 110  93 112 110 113 106 114 107  95  90  91
 88  90  91  93  91  89  83  84  83  84  83  86  92  56  64  69
 77  68  71  75  98  89  69  95  73  86  50  60  61  61  64  78
 64  82  80  68  80  60  62  61  66  70  64  60  63  66  61  60
 62  60  65  89  91  90  90  91  93  90  92  91  95  96  96  96
 97 100 100  98  99  97  98  90  70  65  70  84  66  84  73  82
EOF
```

(88)

```
ENTER LOG DATE (DD/MO/YR) : 19/07/79
ENTER SITE CODE (5 CHARS) : 00202
ENTER USER CODE (4 CHARS) : 7e70
 ENTER JOB CODE (3 CHARS) : 260
```

```
    DATA LOGGED :19 JULY 1979          DATA ANALYZED : 14 SEPT 1979
         LOGGER : DS-301/24                 SITE CODE : 00202
SERIAL NUMBER : 1225                        JOB CODE : 260
       BASELINE : 0.0 V                     USER CODE : 7e70
  A/D IC RANGE : +5.0 V                     CHANNEL : 1
 SAMPLING RATE : 4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8  : 0                STD DEV (V) =   0.03
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE LEVEL (N.E.L.) CALCULATION

```
NEL BASED ON TIME WEIGHTING
TOTAL TIME = 8.0 HOURS
EXCHANGE RATE (DB) = 5
THRESHOLD (CRITERION) LEVEL = 90 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

HOUR	CUMULATIVE	CO SLATIVE	CUMULATIVE	CUMULATIVE
1	91.9	91.9	16.321	16.32
2	94.1	87.1	.345	16.67
3	90.3	84.9	1.[illegible]	1[illegible]
4	95.8	84.4	27.229	[illegible]
5	134.6	96.0	97.441	143.40
6	100.2	96.9	51.119	194.52
7	[illegible]	94.4	49.[illegible]	243.[illegible]
8	89.3	96.7	11.313	254.77

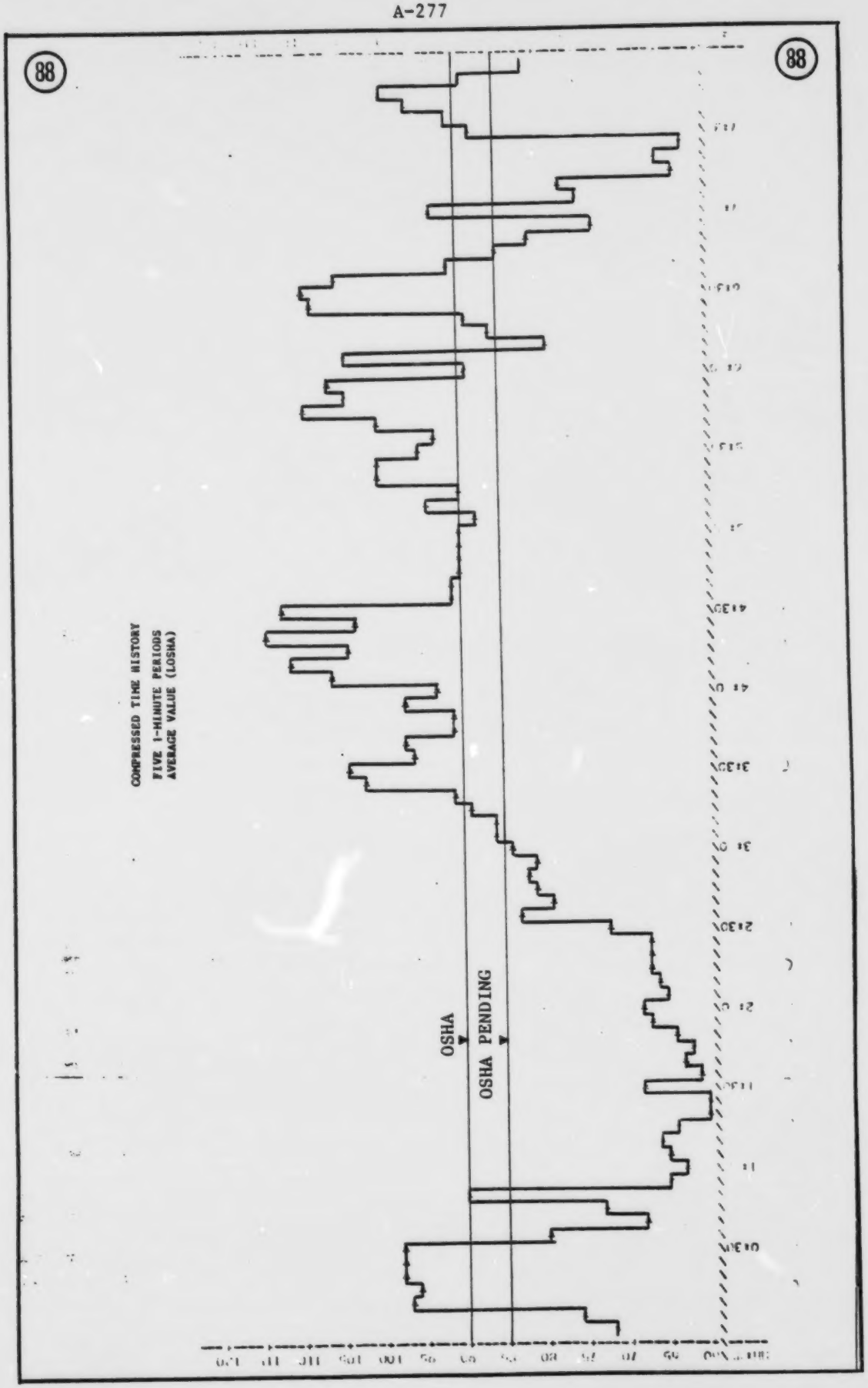
```
MIN. COMP. =  90 DB          MAX. COMP. = 110.72
ARITHMETIC MEAN =  96.78
STD. DEVIATION =  14.[illegible]
VARIANCE = 200.[illegible]
```

88

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
82	17.1	60 TO 64
46	9.6	65 TO 69
24	5.0	70 TO 74
18	3.8	75 TO 79
36	7.5	80 TO 84
59	12.3	85 TO 89
88	18.3	90 TO 94
47	9.8	95 TO 99
31	6.5	100 TO 104
25	5.2	105 TO 109
22	4.6	110 TO 114
2	.4	115 TO 119

TOTAL NO. OF DATA POINTS = 480

88


88
88
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(89)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
1 20 80 1224 60 64 4 1
244 115200 480

63	71	66	74	67	72	71	63	75	74	61	74	74	75	78	71
70	87	100	102	101	100	101	101	95	90	93	94	98	100	100	99
100	99	98	99	100	99	99	95	99	98	96	85	78	65	69	60
60	66	71	66	62	62	63	65	60	61	66	97	95	64	62	61
67	63	63	62	63	63	61	65	65	60	61	61	62	60	63	67
67	70	63	66	63	60	66	70	60	60	60	60	60	60	60	60
60	63	60	60	60	78	65	60	60	60	60	60	65	67	67	63
60	60	61	63	70	75	65	64	60	73	72	73	76	61	60	66
68	77	75	82	73	75	70	71	71	77	66	70	71	65	70	70
72	74	72	68	69	68	73	67	62	71	72	65	74	70	70	68
76	81	80	80	80	89	80	82	81	81	82	83	80	82	80	75
74	66	67	82	73	80	80	80	80	82	82	83	84	87	86	82
82	83	83	89	86	90	87	87	84	86	88	87	86	90	87	85
86	82	90	91	95	100	98	98	100	99	101	99	100	99	98	97
94	91	93	93	102	94	93	93	93	90	91	90	88	93	91	95
95	93	93	100	99	97	95	100	94	92	91	91	92	93	95	105
106	106	106	107	107	107	106	105	92	88	89	89	105	109	108	109
109	98	91	92	96	95	106	104	109	110	90	88	88	90	90	90
91	91	93	91	91	89	90	91	90	88	88	88	87	88	88	89
91	91	91	91	89	90	90	90	90	89	89	90	90	93	100	97
90	90	88	91	93	106	113	114	112	98	115	116	115	98	91	99
115	115	116	117	117	109	92	111	117	116	114	91	95	92	97	100
117	117	117	115	116	116	98	99	114	115	115	115	114	112	113	104
91	92	91	98	109	117	115	111	85	72	64	73	80	81	83	85
89	90	82	78	86	84	85	85	109	113	114	115	114	108	98	115
110	113	111	116	90	89	90	90	89	90	90	91	89	89	76	85
85	85	79	84	73	66	79	75	70	68	70	68	89	88	96	91
82	60	65	64	60	60	61	64	61	85	72	65	80	61	63	65
73	63	61	60	61	60	60	60	62	63	77	90	91	91	91	91
93	91	92	93	95	98	93	97	97	100	99	98	98	97	96	86

(89)

ENDOF

ENTER LOG DATE (DD/MM/YR) : 19/07/79
ENTER SITE CODE (5 CHARS) : CC202
ENTER USER CODE (4 CHARS) : 4126
ENTER JOB CODE (3 CHARS) : 261

DATA LOGGED :19 JULY 1979
LOCUS : [illegible]
SERIAL NUMBER : 1224
BASELINE : [illegible]
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = [illegible]

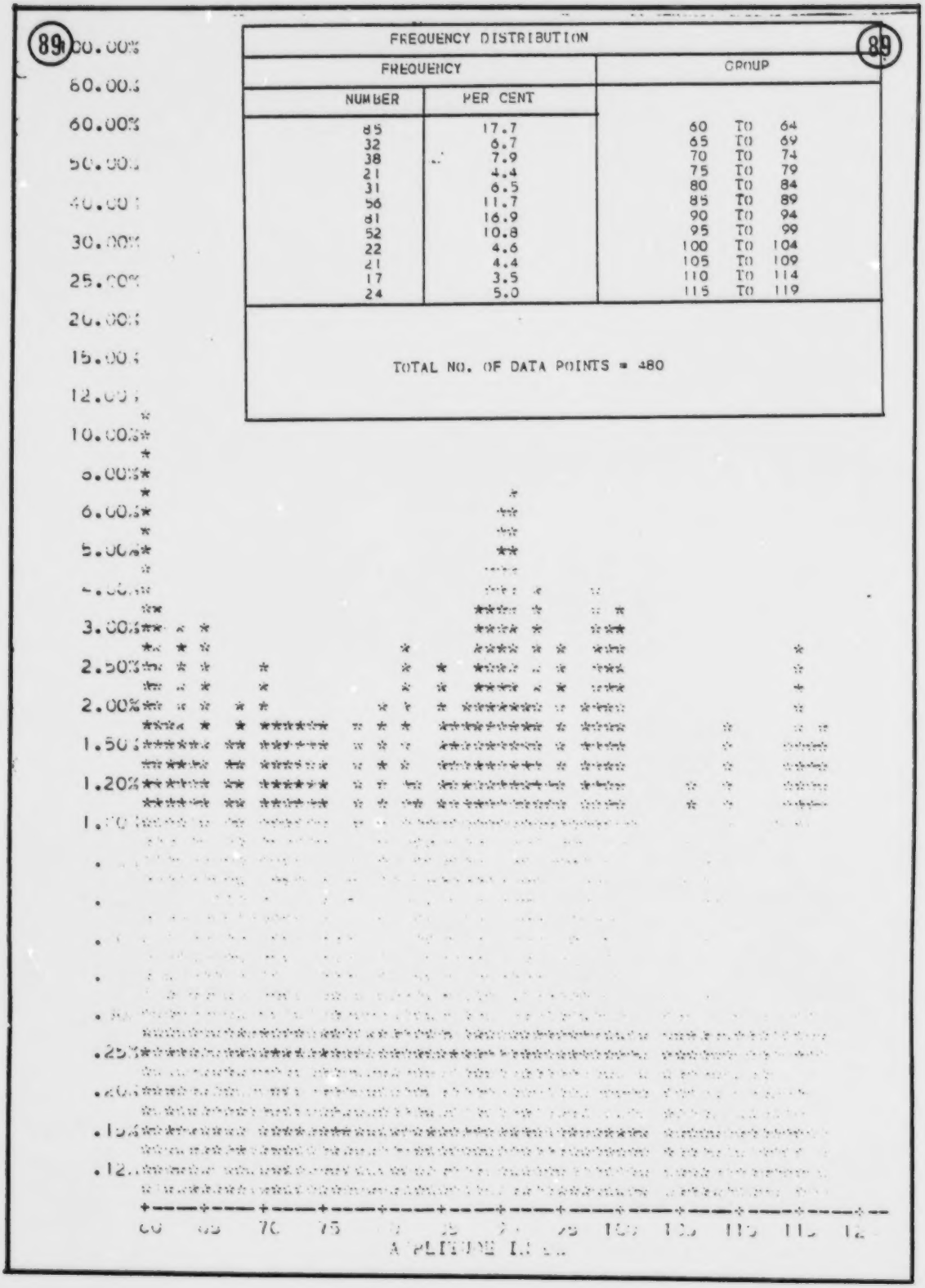
DATA ANALYZED : 14 SEPT 1979
SITE CODE : CC202
JOB CODE : 261
USER CODE : 4126
SERIAL # : [illegible]
TOTAL SAMPLES = 115200
SAMPLING TIME = [illegible]

TIME HISTORY ANALYSIS

[illegible] EQUIVALENT LEVEL (L.E.Q.) CALCULATIONS
USE BASE OF THE LOGARITHMS
[illegible] = [illegible]
[illegible] =
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 [illegible]

TIME HOUR	LEQ CURRENT	LEQ CUMULATIVE	SOUND EXPOSURE CURRENT	SOUND EXPOSURE CUMULATIVE
1	93.0	93.0	10,473	15.87
2	[illegible]	[illegible]	[illegible]	19.33
3	79.5	[illegible]	1,671	21.00
4	92.7	88.2	16,074	37.07
5	100.6	92.9	93,998	93.06
6	106.7	96.0	136,778	250.85
7	106.7	100.7	129,617	345.47
8	98.6	99.9	18,344	366.60

MIN. CURR. = 60.00 MAX. CURR. = 117.00
MEAN SOUND LEVEL = [illegible]
STD. DEVIATION = 17.[illegible]
VARIANCE = [illegible]



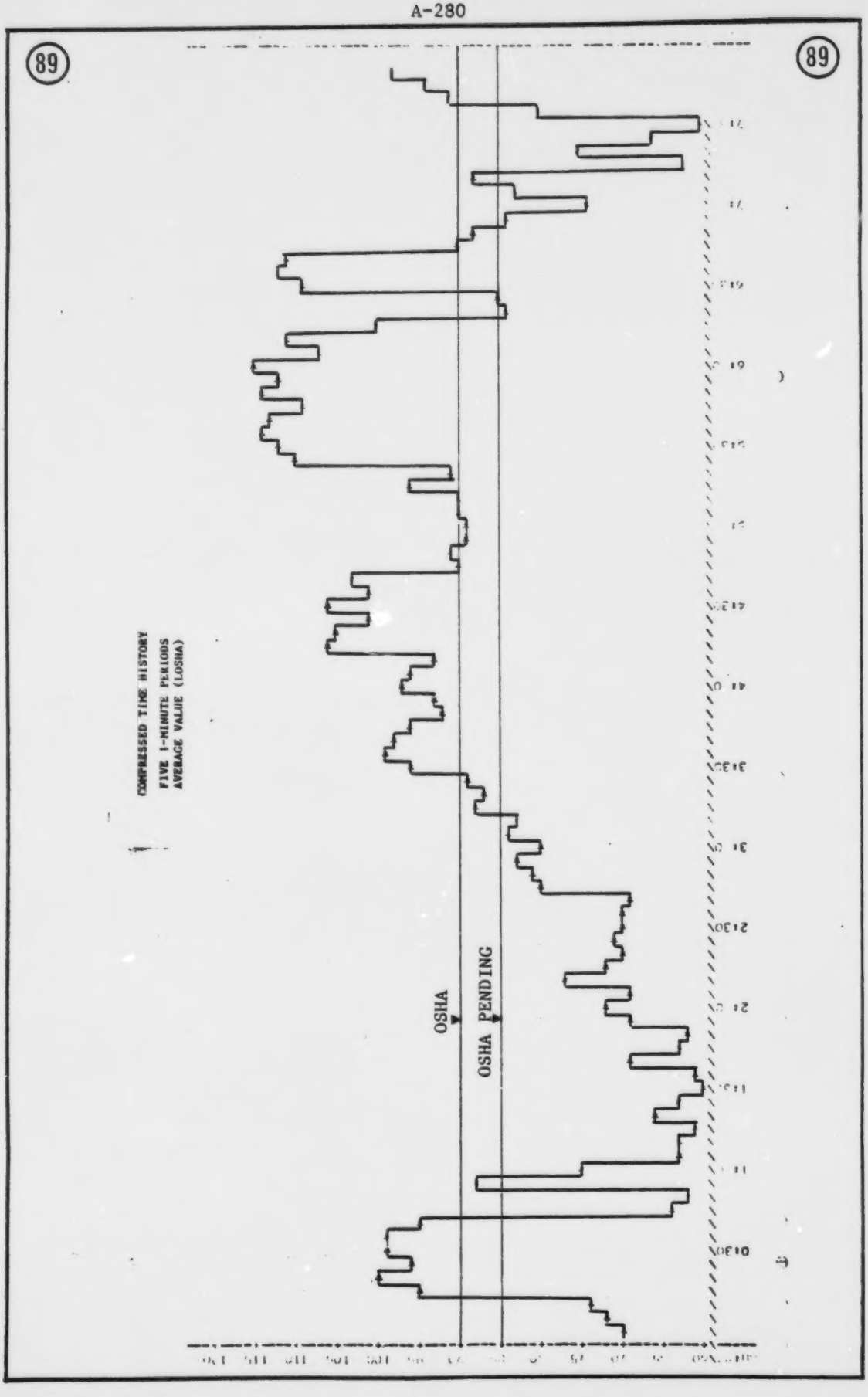
89

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
85	17.7	60 TO 64
32	6.7	65 TO 69
38	7.9	70 TO 74
21	4.4	75 TO 79
31	6.5	80 TO 84
56	11.7	85 TO 89
81	16.9	90 TO 94
52	10.8	95 TO 99
22	4.6	100 TO 104
21	4.4	105 TO 109
17	3.5	110 TO 114
24	5.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480

89


89
89
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

90

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1221    60    64     4     1
     41      115200  480
 71  70  63  64  62  66  68  74  82  71  82  91  91  94  94  94
 93  98 102 100 100  98  97 100  96  98  96  75  71  64  60  60
 60  61  60  60  61  60  60  60  63  66  71  65  72  63  62  60
 60  68  65  61  66  70  71  70  93  96  89  93  89  87  88  86
 87  85  83  88  86  86  86  87  90  88  86  87  87  86  88  87
 92  91  89  86  87  87  84  86  84  88  89  87  89  88  94  94
 96  95  96  94  99  93 108 107  95  99  97  99 109 109 109 111
108  92  84  86 106 114 115 108  86  88  86  91  88  86  93  88
 86  86  85  86  85  84  86  85  86  87 102 109 112 112 109  99
 85  87  88  89  86  87 104 107 107 104  94  86 105 110 110 111
113 105  86 100 111 114 114 114 115 114 109  97  89  86  86  85
 84  87  84  85  85  86  87  86  88  84  86  85  86  91 112 114
 90  86  97 110 112 111 111 112 109  87  95 111 113 114 115 114
100  86  86  85  85  86  90  84  87  96  86  98 106 109 107 103
 87  87  89 109 107 107 107  94  86  86  87  89  86  85  86  87
 93  94  91  96  88  87  80  80  80  80  80  80  80  80  80  72
 73  67  63  62  65  71  70  66  70  70  64  60  69  75  64  64
 62  73  67  71  64  60  60  64  65  60  69  71  68  69  60  60
 61  68  60  60  60  87  91  93  96  86  92  87  86  85  84  84
 84  86  85  86  83  88  87  87  88  87  87  85  87  85  90  91
 96  92  64  62  69  61  66  78  98 100  95  95  90  87  75  82
 87  88  99 105 100  72  79  89  90  90  86  92  91  85  85  84
 83  85  84  86  86  86  87  87  86  87  86  88  85  89  90  87
100 106 106  92  87 103 109 109 106 103  90  86  86  86  87  87
 87  86  89 105 107  98 100  91  87  87  95 104 108  99  89  88
 86  87  87  91  86  98  90  88  92  91  85  84  84  84  86  86
 93  88  89  93  92  86  90  96  90  71  60  60  60  60  61  64
 60  70  69  60  60  68  63  60  64  74  67  76  66  81  62  70
 67  73  76  72  68  72  78  75  67  72  81  95  93  94  96  99
103  94  86 103  97  94  97  86  90  89  98 103 104  96  94  79
(50F
```

90

```
ENTER LOG DATE (DD/MM/YR) : 17/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 0650
 ENTER JOB CODE (3 CHARS) : 261
```

@

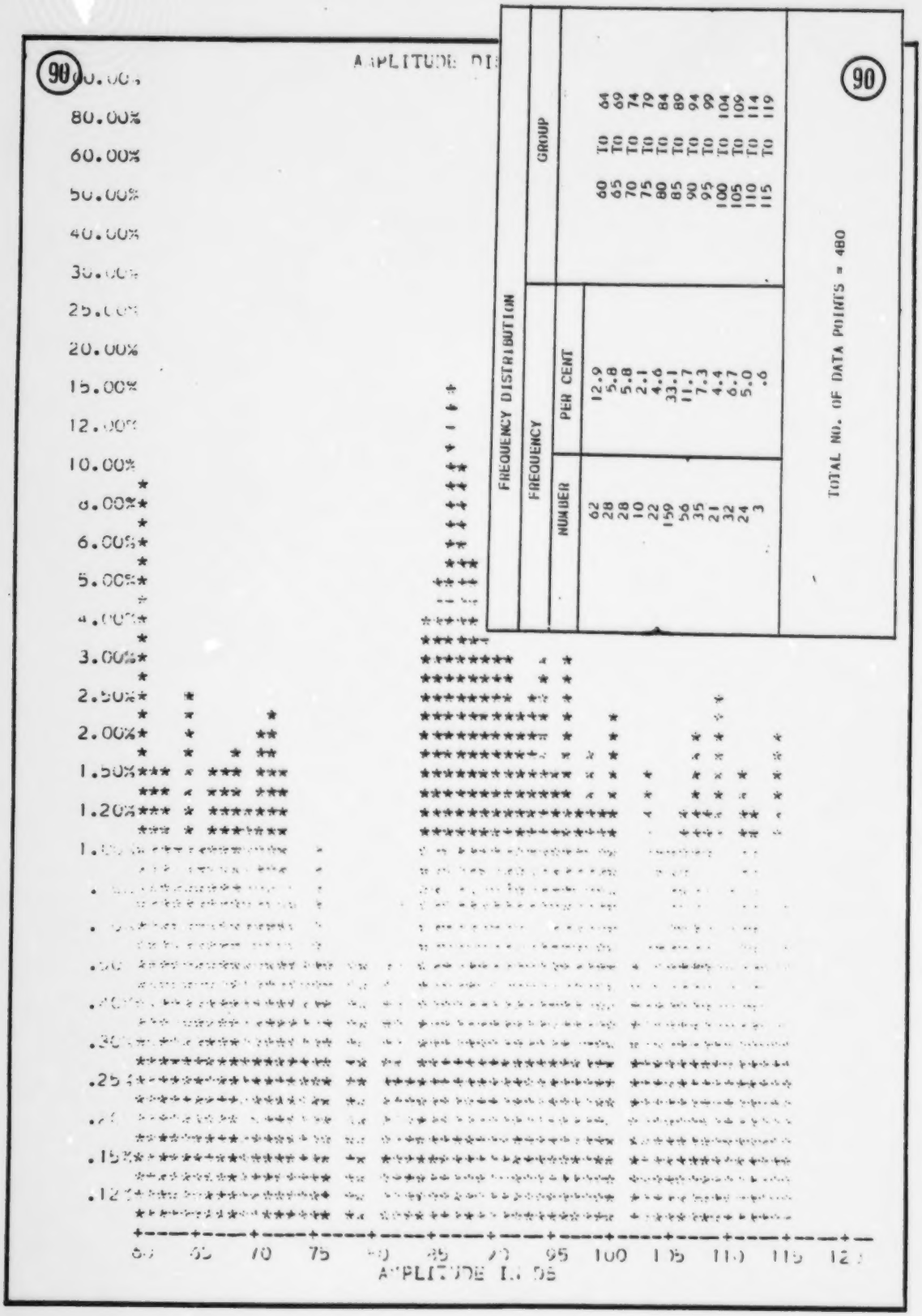
```
    DATA LOGGED :17 JULY 1979          DATA ANALYZED : 13 SEPT 1979
         LOGGER : DB-301/26                 SITE CODE : CC210
  SERIAL NUMBER : 1221                        JO  CODE : 261
       BASELINE : 80 DB                       USER CODE : 0650
  DYNAMIC RANGE : 64 DB                       THRESHOLD : 80 DB
  SAMPLING RATE : 4/SEC                  TOTAL SAMPLES =  115200
  TEST DURATION =  8 HR  0 MIN          STANDBY TIME =  0 HR 0 MIN
```

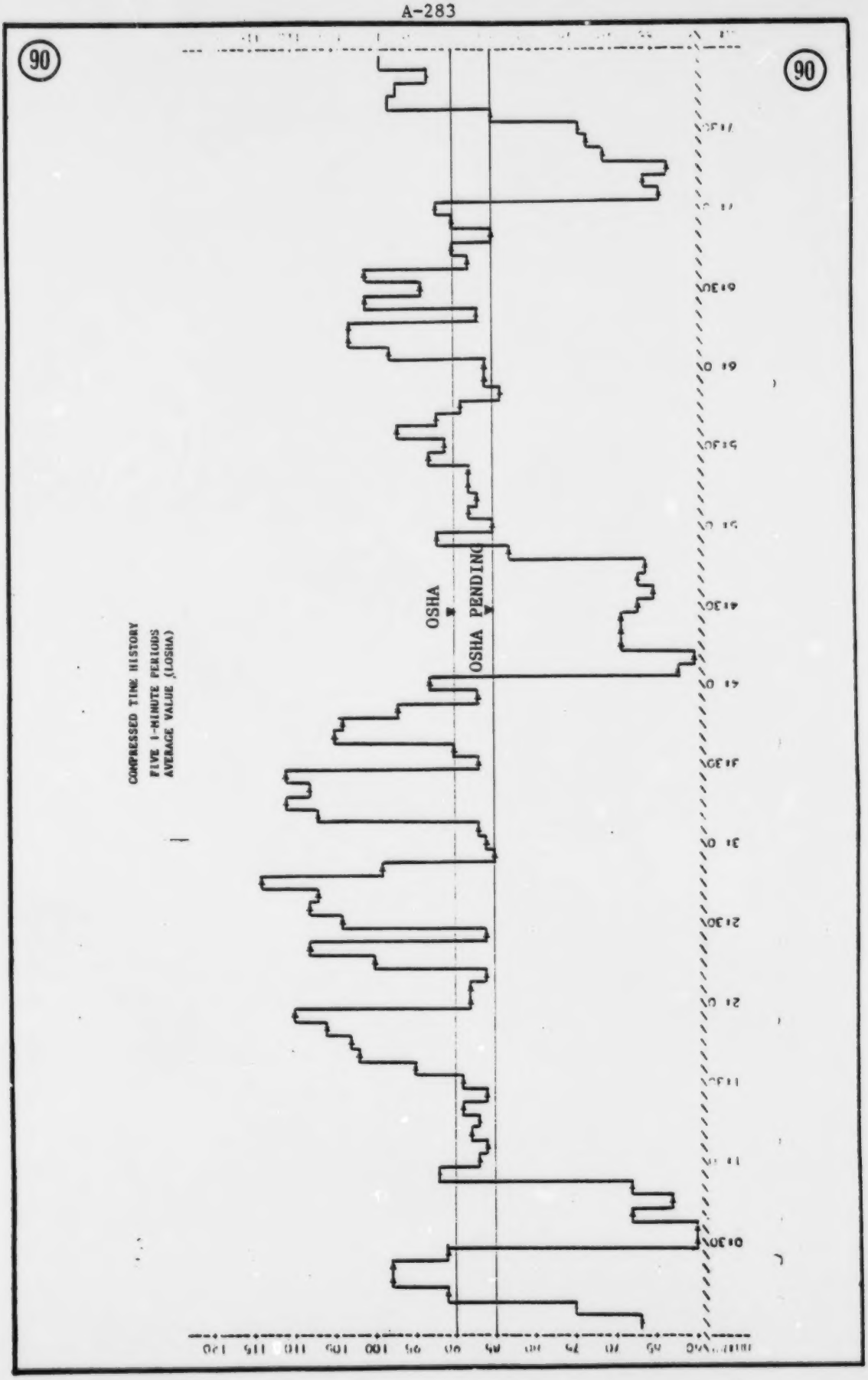
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOG DOSE = 7 DB / 3 DB
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOG A		LOG B	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	88.8	88.8	10.627	10.63
2	99.4	99.9	46.301	56.93
3	101.8	99.4	90.965	147.892
4	103.8	100.9	85.135	227.10
5	81.1	99.4	3.633	230.74
6	89.9	98.5	12.296	243.04
7	90.9	98.3	32.347	275.38
8	90.5	97.7	23.412	298.79

MIN. COMP. = 80 DB MAX. COMP. = 115 DB
ARITHMETIC MEAN = 85.08
STD. DEVIATION = 15.94
VARIANCE = 253.98


90
AMPLITUDE DI
80.00%
60.00%
50.00%
40.00%
25.00%
20.00%
15.00%
10.00%
6.00%
5.00%
3.00%
2.50%
2.00%
1.50%
1.20%
.25%
.15%
.12%
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 62 12.9
65 TO 69 28 5.8
70 TO 74 28 5.8
75 TO 79 10 2.1
80 TO 84 22 4.6
85 TO 89 159 33.1
90 TO 94 56 11.7
95 TO 99 35 7.3
100 TO 104 21 4.4
105 TO 109 32 6.7
110 TO 114 24 5.0
115 TO 119 3 .6
TOTAL NO. OF DATA POINTS = 480
90
60 65 70 75 80 85 90 95 100 105 110 115 12
AMPLITUDE IN DB


90
90
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30

(91)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

```
  1  26  80  1219      60    64     4     1
      19      115250  480
  60  60  60  60  66  72  62  60  60  60  65  60  60  60  60  60
  67  66  74  73  76  68  63  61  69  67  63  73  67  69  62  60
  61  61  60  63  63  60  62  63  65  70  72  62  65  90  91  91
  92  91  93  93  94  90  92  94  92  92  91  94  95  62  90  73
  81  82  83  88  96  96  96  99 102 101  97  95  98 101  97  96
  96  79  69  60  71  69  60  64  60  60  60  60  65  70  62  71
  64  60  65  60  63  68  66  78  74  62  60  61  61  60  62  60
  60  60  64  60  60  60  69  64  62  60  60  60  60  60  60  60
  66  77  66  63  60  60  60  65  63  60  63  60  74  60  63  60
  71  62  67  72  69  75  65  67  70  69  75  67  63  68  73  73
  72  76  74  89  93  96  87 100  96  96  92  87  84  90  81  85
  82  82  85  84  81  88  92 102  95  88  81  89  89  90  92  96
  91  89  87  86  82  91  91  98  97  88  90  90  89  89  89  96
  88  89  89  86  86  84  90  90  93  92  94  98  91  90  93  95
  92  93  92  90  92  85  83  86  86  88  85  85  86  86  87  88
  87  87  86  86  86  86  87  86  87  92  92  93  94  94  95  98
  91  94  92  96  92  89  97  98  94  96  98 100 101  99  95  87
  89  90  87 102 104 109 106 102  95  89  87  88  86  85  85  87
  86  86  87  86  86  86  89  87  87  91  89  87  87  86  91  92
  97  93  81  75  71  61  61  62  60  63  60  62  68  76  69  68
  63  67  76  71  77  61  66  61  69  71  72  64  71  73  67  60
  90  90  75  74  95 100 104  99  95  90  93  90  90  90  90  90
  89  89  87  85  84  90  88  86  83  87  86  86  86  94 103  93
 101  87  86  86  96 102  99  85  85  88  88  87 107 111 107  88
  86 105 110 106  86  85  86  93  89  88 105 110 111 110  97  93
  93 105  89 107 108 110 109 110  86  89  86  92  87  89  94  87
  88  89  89  93  86  83  83  84  84  86  85  85  88  94  99  96
  90  75  73  60  62  66  67  60  63  67  61  60  62  95  90  76
  73  69  73  68  72  76  68  72  75  95  91  78  76  71  67  75
  79  79  80  70  66  68  65  76  80  73  72  71  69  88  94  98
%EOF
```

(91)

```
ENTER LOG DATE (DD/MM/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC231
ENTER USER CODE (4 CHARS) : 0850
 ENTER JOB CODE (3 CHARS) : 261
```

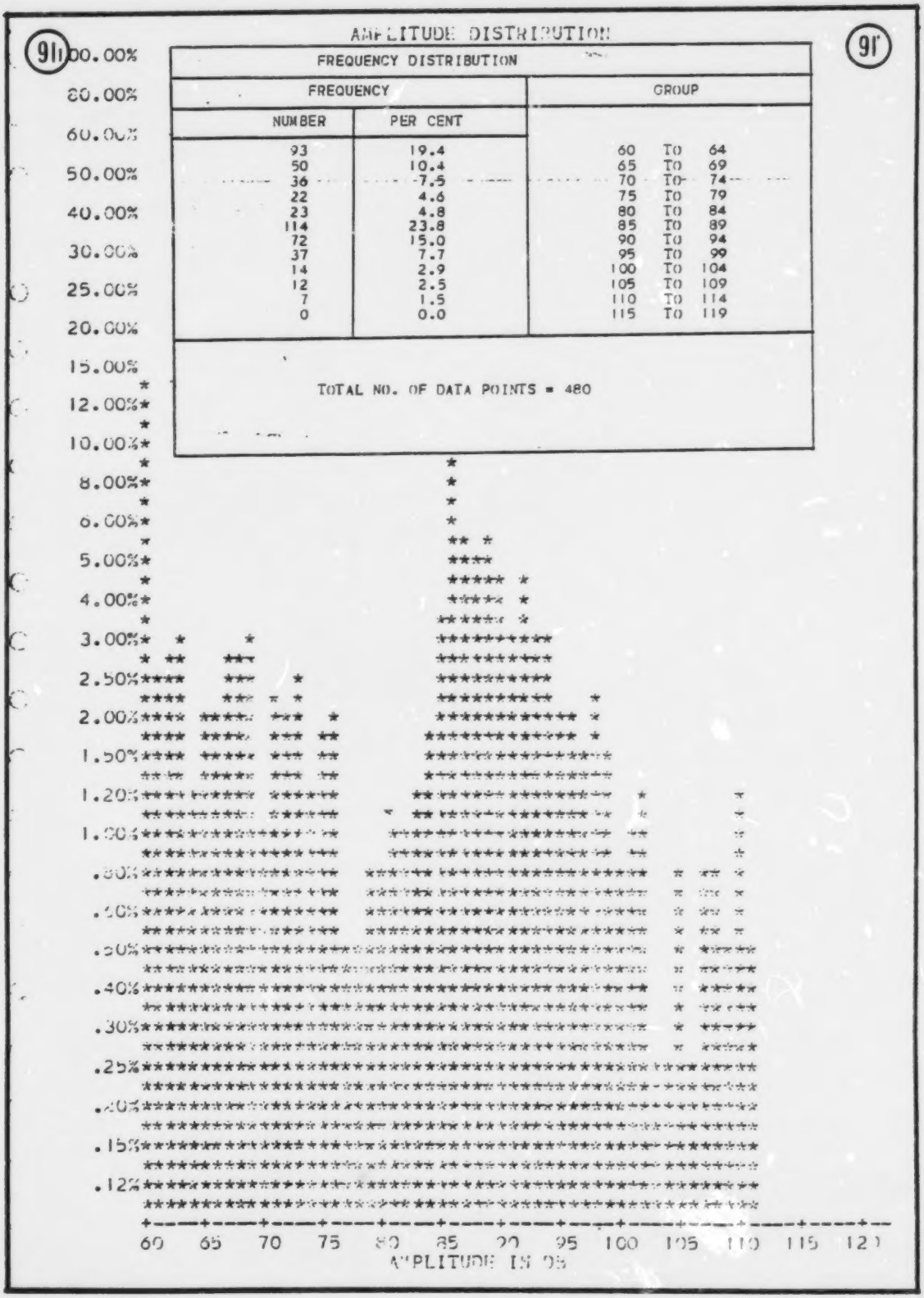
```
   DATA LOGGED :12 JULY 1979          DATA ANALYZED : 12 SEPT 1979
        LOGGER : DE-301/20                 SITE CODE : CC231
 SERIAL NUMBER : 1219                       JOB CODE : 261
      BASELINE : 60 DB                      USER CODE : 0850
 DYNAMIC RANGE : 64 DB                    THRESHOLD : 80 DB
 SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
 TEST DURATION =   8: 0: 0            STANDBY TIME =  0: 0: 0
```

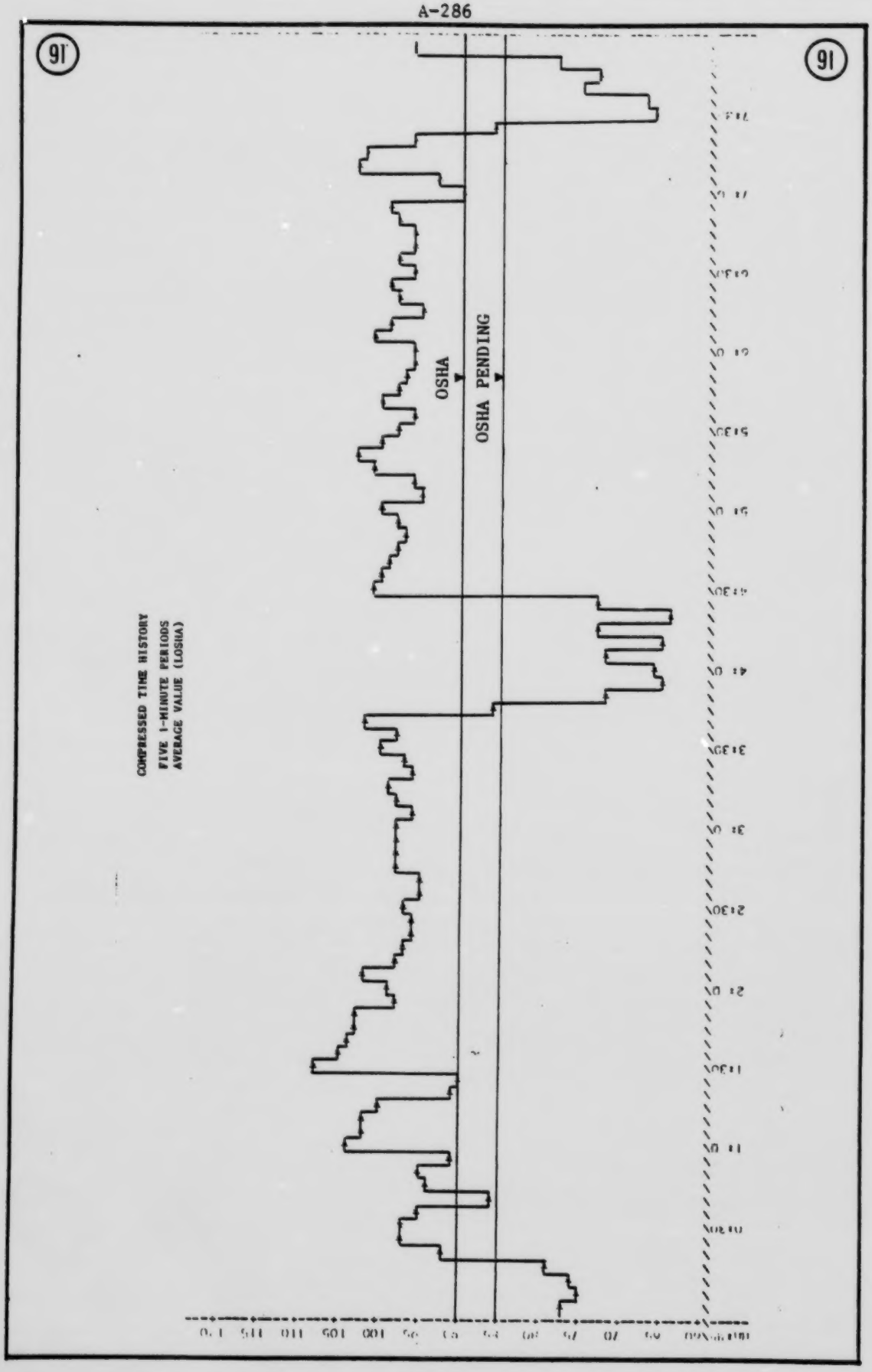
TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	82.7	82.7	4.526	4.53
2	84.3	86.0	9.906	14.43
3	81.2	84.7	3.673	18.11
4	90.7	85.7	13.731	31.84
5	94.7	89.2	24.129	55.97
6	87.4	88.9	8.713	64.68
7	100.7	92.3	65.183	114.87
8	84.8	91.7	5.950	129.82

```
MIN. COMP. =  60 DB                MAX. COMP. = 111 DB
ARITHMETIC MEAN =  80 DB
STD. DEVIATION =  14 DB
VARIANCE = 199 DB
```


AMPLITUDE DISTRIBUTION
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
93 19.4 60 To 64
50 10.4 65 To 69
36 7.5 70 To 74
22 4.6 75 To 79
23 4.8 80 To 84
114 23.8 85 To 89
72 15.0 90 To 94
37 7.7 95 To 99
14 2.9 100 To 104
12 2.5 105 To 109
7 1.5 110 To 114
0 0.0 115 To 119
TOTAL NO. OF DATA POINTS = 480
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


16
16
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

92

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

92

```
  1  26  80  1218   60   64    4    1
   71936      59136  246
 60  60  66  60  61  60  60  61  60  60  62  66  77  75  70  60
 63  68  70  68  68  78  67  72  69  67  70  71  67  76  66  61
 67  60  60  60  60  60  60  65  68  62  60  63  60  74  70  69
 89  89  91  90  89  90  99 100 100 101  98 100 101  98  96  94
 95  93  93  96  94  94  90  94  94  95  90  92  92  90  91  79
 67  62  75  62  62  78  73  63  66  68  70  60  60  60  60  60
 60  60  62  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  61  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  61  60
 63  66  71  67  60  60  60  60  60  60  61  60  60  60  60  60
 60  60  78  91  94  94  84  90  88  91  95  94  95  88  82  86
 91  94  93  93  87  87  94  86  82  92  95  68  68  90  95  95
 95  93  89  90  99  97  96  98  93  93  82  63  82  78  61  62
 69  68  84  88  73  60  61  60  64  60  60  60  60  60  60  64
 60  60  60  65  60  60  60  60  60  60  60  61  63  58  62  64
 60  73  60  60  67  64  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  50  60  60  60  60  60  60  60  60  60  60
%EOF
```

ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : 20065
ENTER USER CODE (4 CHARS) : 7960
ENTER JOB CODE (3 CHARS) : 010

DATA LOGGED	27 JULY 1979	DATA ANALYZED	20 SEPT 1979
LOGGER	DB-301/26	SITE CODE	20065
SERIAL NUMBER	1218	JOB CODE	010
BASELINE	60 DB	USER CODE	7960
DYNAMIC RANGE	64 DB	THRESHOLD	80 DB
SAMPLING RATE	4/SEC	TOTAL SAMPLES	59136
TEST DURATION	4: 6:24	STANDBY TIME	4:59:44

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 246
PERIOD = 1 MINUTES

TIME	LOSHA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.6	85.6	6.424	6.42
2	86.3	86.0	7.521	14.35
3	82.8	85.1	4.637	18.98
4	86.1	85.4	7.306	26.29
5	65.8	85.2	.044	26.33

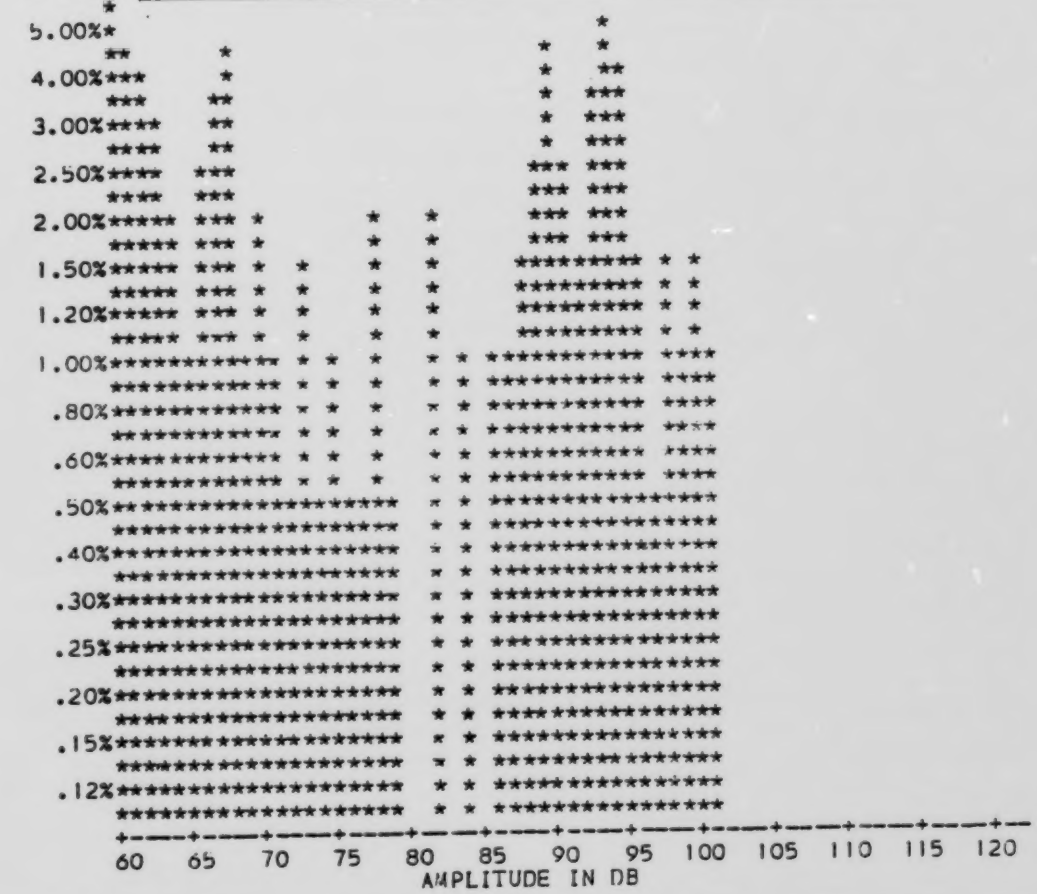
MIN. COMP. = 60 DB
MAX. COMP. = 101 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 14 DB
VARIANCE =196 DB

AMPLITUDE DISTRIBUTION

(92) (92)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
361	75.2	60 TO 64
25	5.2	65 TO 69
11	2.3	70 TO 74
9	1.9	75 TO 79
6	1.3	80 TO 84
12	2.5	85 TO 89
34	7.1	90 TO 94
17	3.5	95 TO 99
5	1.0	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

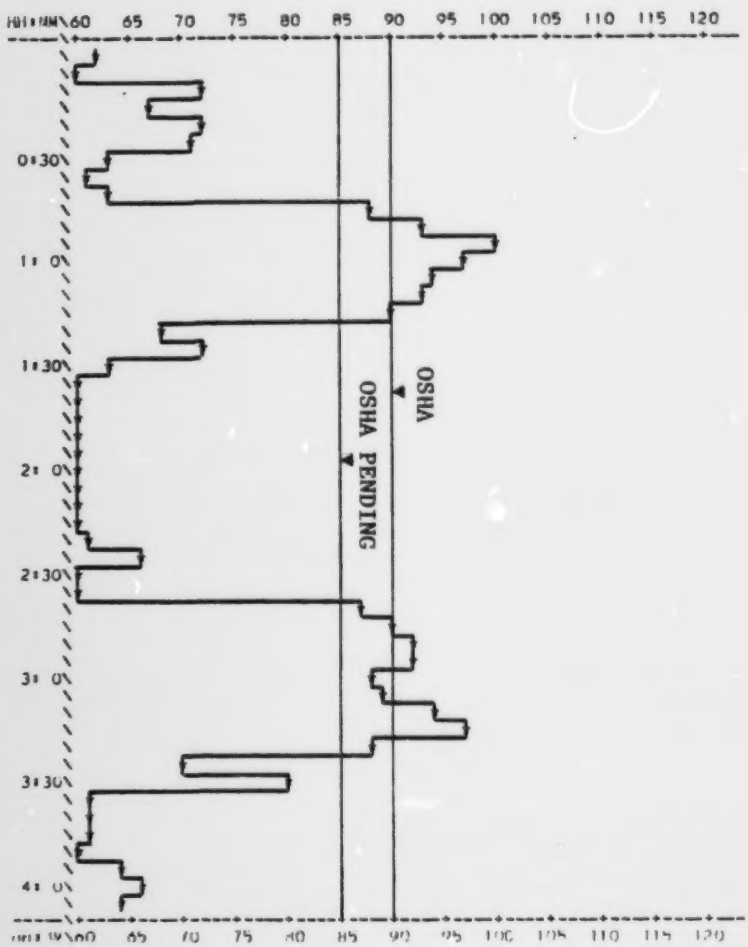
TOTAL NO. OF DATA POINTS = 480



(92) (92)

COMPRESSED TIME HISTORY
FIVE 1 MINUTE PERIODS

AVERAGE VALUE (LOSHA)



(93)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1221     60    64     4     1
     21     115200   480
  60  60  60  60  61  60  60  62  71  61  61  60  60  60  70  60
  63  67  60  65  62  62  67  60  61  60  60  64  63  60  65  60
  60  60  70  67  68  75  75  72  70  88  89  91  91  91  94  92
  93  97 101 101 102 103 103 104 103  98  95 101  98  94  96 101
  93  97  92  97  98  99  95  97  93  96  90  88  91  99  95  97
  98  89  90  92  95  93  98  93 100  97  90  97  94  92  92  92
  92  92  93  92  96  96  95  95  95  95  95  95  95  95  94  95
  95  95  96  95  95  95  94  95  98  86  81  87  85  82  82  87
  99  92  97  98  98 100  96  87  84  89  89  89  91  94  97  97
  98  94  97  88  84  80  79  85  91  90  92  98  94  91  96  97
  94  95  95  90  95  93  92  99  93  81  93  97  98  92 100  98
  99  95  95  95  90  90  89  89  95  81  82  81  81  81  81  81
  81  81  81  81  81  81  82  81  88  99 100  99  97  92  92  97
  93 101  99  95  99  97 106 108 108 107 107  91  90  93  97  94
  95 100 100  91  97  96  91  84  84  85  86  88  99  97  93  91
  97 101  98  99  93  76  60  60  60  60  60  75  60  60  60  60
  60  60  60  85  89  84  68  75  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  68  92  68  77  96  97  94  97  98  98  97
  83  82  87  82  83  89  98  98  99  96  99 103 101  89  89  90
  89  89  90  89  89  88  89  95  98  96  97 100  96  79  60  60
  80  89  94  96  99  97  95  86  86  95  99 100  98  99  99  99
  98 100 100 100 100 103  98 100 101 104 104 104 103 104 103  98
  91  98 100 100  99  98  97  87  86  90 100 100 100 102  98  96
  93  98  91  89  87  89  91  92  95  97  83  93  99 100 101 100
  90  95  93  86  83  91  98  93  81  85  89  95  96  94  92  96
  99  95  97  99  95  93  90  93 100  96  96  98  98  87  82  82
  82  97  93  80  87  97  95  93  89  78  64  62  61  60  66  65
  82  77  73  72  87  94  95  97  95  97  92  88  93 100  99  97
%EOF
```

(93)

```
ENTER LOG DATE (DD/MM/YR) : 27/07/79
ENTER SITE CODE (5 CHARS) : 20065

ENTER USER CODE (4 CHARS) : 4483
 ENTER JOB CODE (3 CHARS) : 272
```

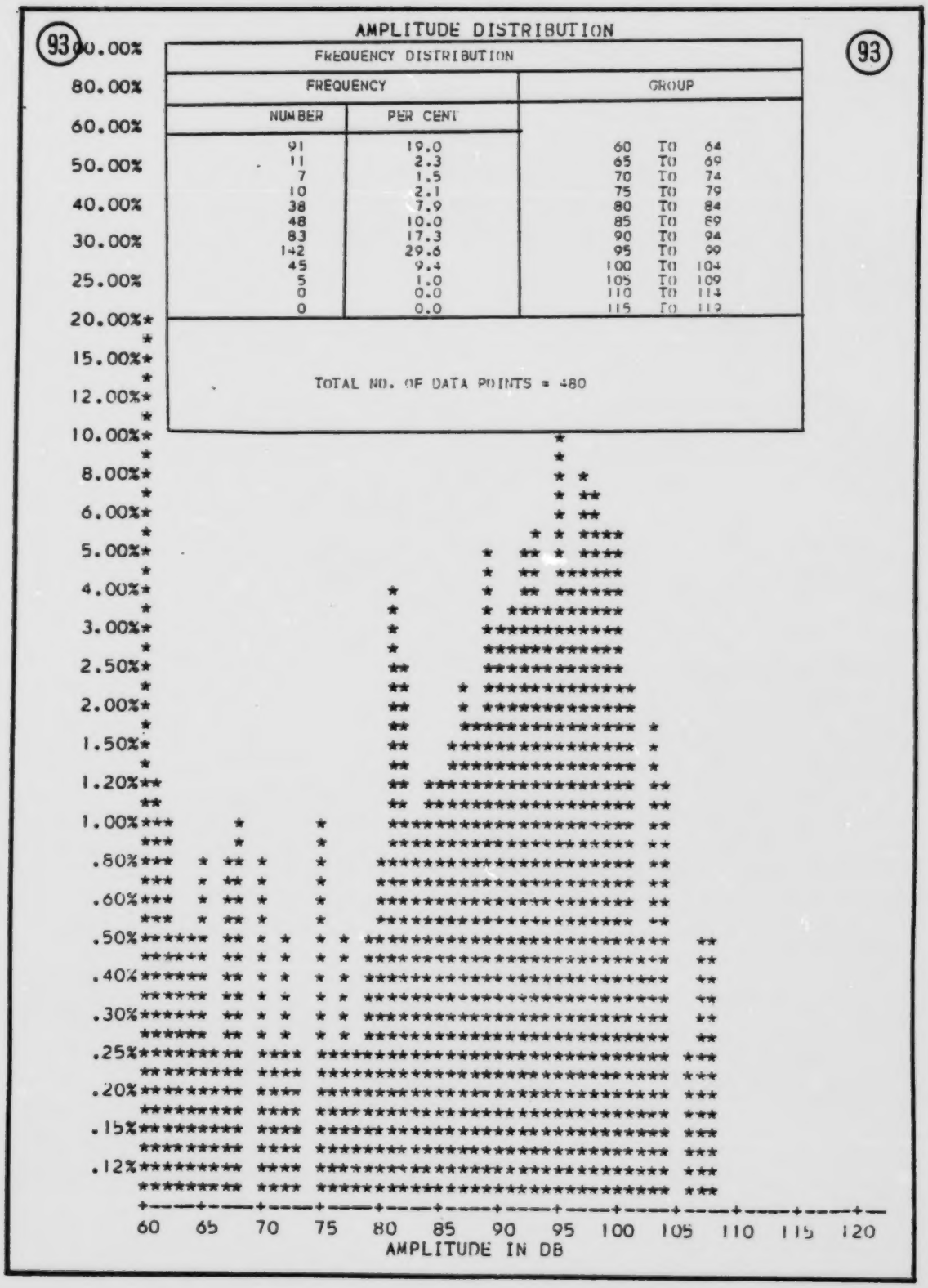
```
   DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
       LOGGER : DB-301/26                 SITE CODE : 20065
SERIAL NUMBER : 1221                       JOB CODE : 272
     BASELINE : 60 DB                     USER CODE : 4483
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC            TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0          STANDBY TIME =   0: 0: 5
```

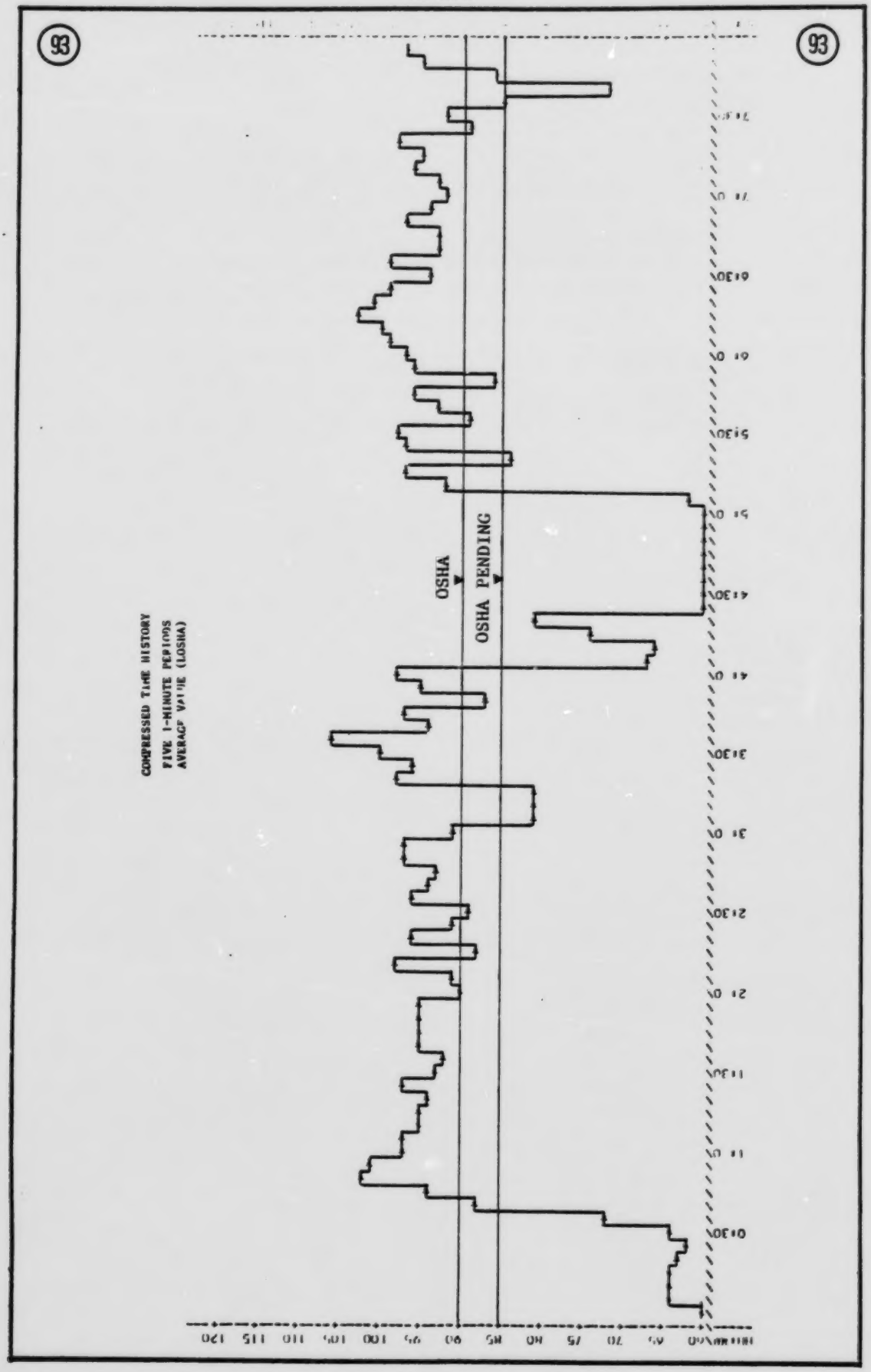
TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 9 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		%DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	90.3	90.3	13.094	13.09
2	95.1	93.1	25.392	38.49
3	94.0	93.4	21.631	60.12
4	96.1	94.2	28.918	89.03
5	81.4	92.9	3.804	92.84
6	92.8	92.8	18.310	111.15
7	98.2	93.9	39.104	150.24
8	92.9	93.8	18.713	168.97

MIN. COMP. = 60 DB MAX. COMP. = 108 DB
ARITHMETIC MEAN = 86 DB
STD. DEVIATION = 14 DB
VARIANCE =196 DB


AMPLITUDE DISTRIBUTION
93
93
FREQUENCY DISTRIBUTION
FREQUENCY
NUMBER
PER CENT
GROUP
91 19.0 60 TO 64
11 2.3 65 TO 69
7 1.5 70 TO 74
10 2.1 75 TO 79
38 7.9 80 TO 84
48 10.0 85 TO 89
83 17.3 90 TO 94
142 29.6 95 TO 99
45 9.4 100 TO 104
5 1.0 105 TO 109
0 0.0 110 TO 114
0 0.0 115 TO 119
TOTAL NO. OF DATA POINTS = 480
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB


93
93
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0130
1 00
1130
2 00
2130
3 00
3130
4 00
4130
5 00
5130
6 00
6130
7 00
65
70
75
80
85
90
95
100
105
110
115
120

(94)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1220   60   64    4    1
      98      115200  480
  60  60  62  62  72  63  67  62  60  63  66  60  60  61  64  60
  60  62  60  60  63  70  76  73  63  78  71  70  73  73  72  73
  77  75  75  74  72  77  76  78  67  80  78  72  71  82  80  78
  73  75  73  77  76  76  72  78  81  60  60  62  61  60  62  64
  60  66  66  60  60  63  71  68  67  74  75  66  62  64  64  72
  71  67  72  63  60  77  67  61  62  67  69  63  60  60  63  60
  61  61  65  60  62  62  62  62  62  71  75  70  67  67  66  61
  78  78  89  93  96  89  92  91 101  98  87  80   9  88  87  95
 102  99  96 100  99 102  94  95  93  99  92  91  89  82  63  61
  63  62  65  67  70  61  60  65  63  60  68  60  60  60  61  62
  62  64  62  60  60  61  60  60  60  61  63  61  65  62  60  60
  84  90  95  97  96  94  95  93  92  90  93  92  94  96  96  94
  88  89  86  88  94  93  93  97 101  98  87  85  71  76  80  81
  80  79  75  78  79  65  66  87  90  78  80  60  63  65  70  61
  65  80  84  82  80  83  84  87  90  77  81  83  79  79  78  79
  78  79  74  90  90  81  86  75  82  67  77  85  72  86  81  85
  87  90  94  91  88  88  88  88  92  85  83  86  82  85  82  82
  80  82  86  82  83  84  83  83  76  99 105 102 102 102  96  87
  87  87  88  88  88  88  89  90 101 102 102  93  85  84  96  97
 101 102 102 102 101 102 103 103 104 102 100 100 101 102 100 101
 101  99  95  91  96  90  90  90 102 101  98 100 100 100 100 100
 102 102 102 101 101 100 102 101 100  87  81  60  60  60  60  74
  95  76  60  60  60  60  69  90  98  96  87  87  87  87  88  93
  88 102 103  99 101 101 102 102 103 103 103 102 102 101 102 100
 100 103 104 104  90  88  98 103 102 102 103 102  92  90  97 101
 106 103 102 100 104  97  94  86  76  67  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  66  75  60  60  60  60  66  67  61  64  69  60  60  61  60
  60  60  60  60  60  60  60  60  78  83  93 101 104 104 104 104
 105 105 104 105 106 106 104 105 104 103  91  62  73  68  61  67
%EOF
```

(94)

```
ENTER LOG DATE (DD/MM/YR) : 13/09/79
ENTER SITE CODE (5 CHARS) : 00307
ENTER USER CODE (4 CHARS) : 4753

 ENTER JOB CODE (3 CHARS) : 213
```

```
   DATA LOGGED :13 SEPT 1979          DATA ANALYZED : 27 SEPT 1979
        LOGGER : [illegible]-301/26        SITE CODE : 00307
 SERIAL NUMBER : 1220                      JOB CODE  : 213
         LABELS : [illegible]              USER CODE : 4753
 DYNAMIC RANGE : [illegible]               CHANNEL   : 80
 SAMPLING RATE : 4/SEC                     TOTAL SAMPLES = [illegible]
 TEST DURATION = [illegible]               SCALE FACTOR = [illegible]
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
[illegible] = 90 DB / 8 HRS
[illegible] CRITERION LEVEL = [illegible]
[illegible] LEVEL = [illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	72.6	72.6	1.125	1.12
2	78.0	75.3	2.344	3.42
3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]
5	91.5	87.0	15.456	41.05
6	98.1	90.4	38.273	79.36
7	[illegible]	[illegible]	[illegible]	[illegible]
8	94.6	94.6	23.757	142.96

MIN. COMP. = 60 DB MAX. COMP. = [illegible] DB
ARITHMETIC MEAN = 80 DB
STD. DEVIATION = 16 DB
VARIANCE = [illegible] DB

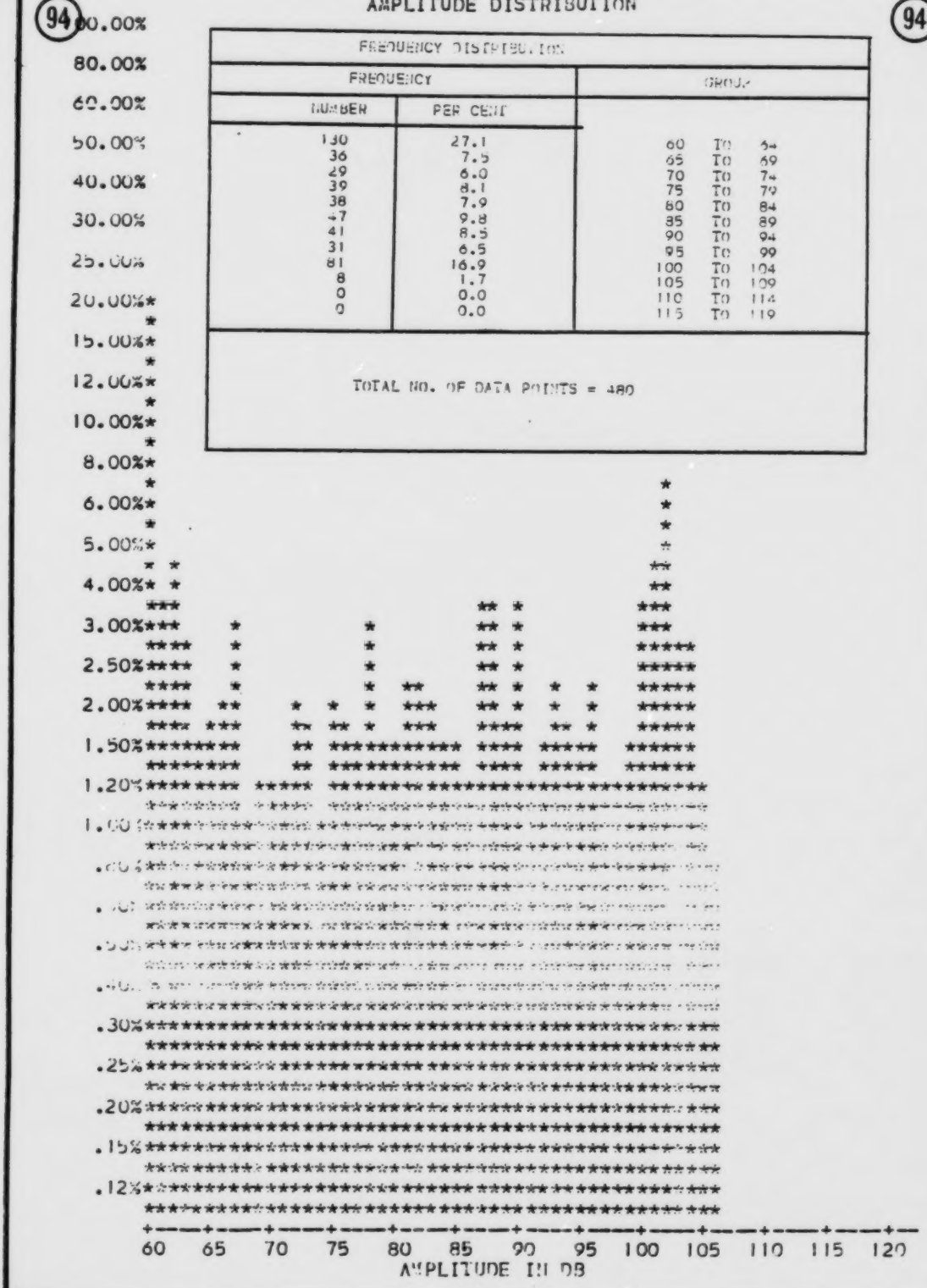
AMPLITUDE DISTRIBUTION

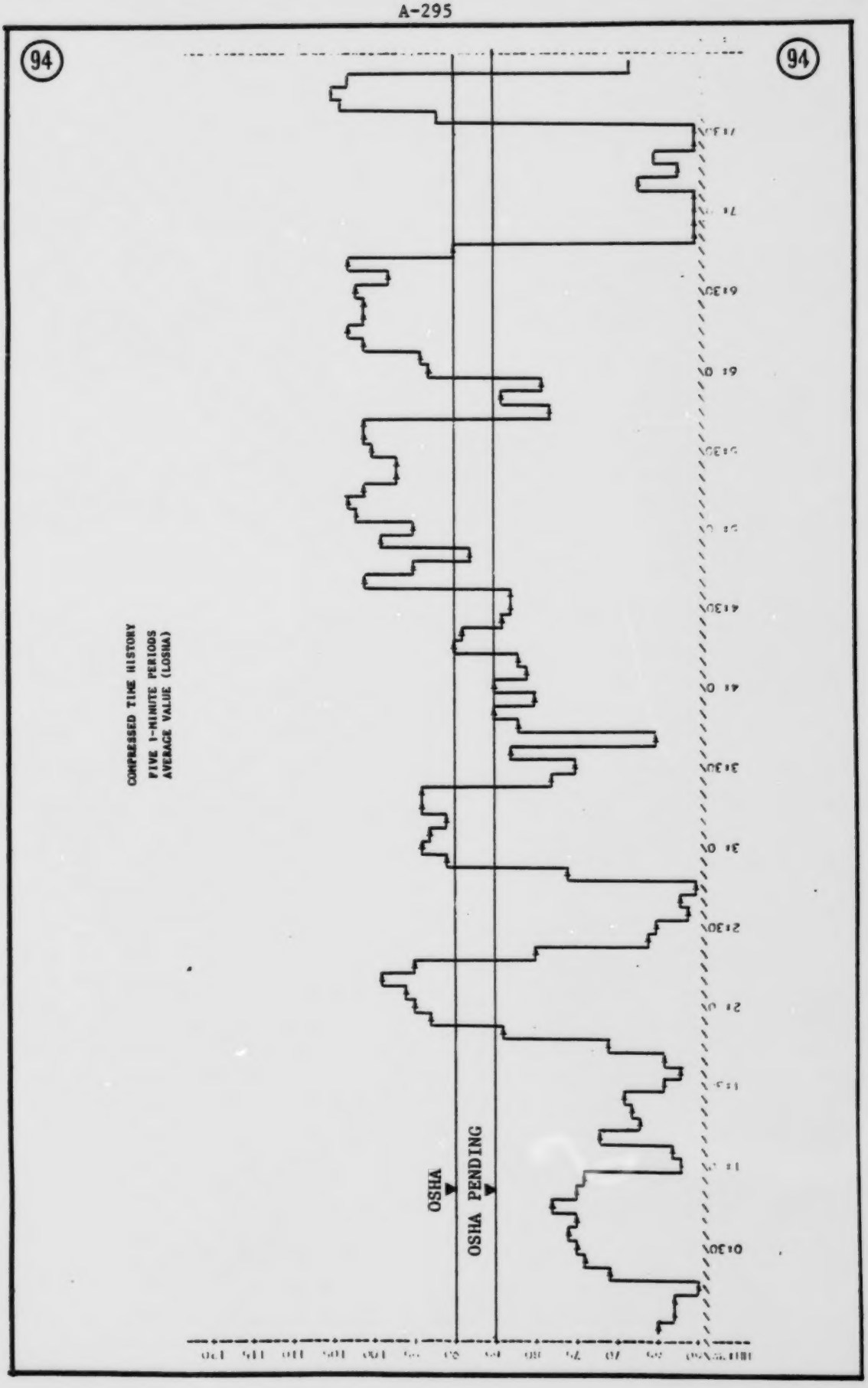
(94) (94)

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
130	27.1	60 TO 64
36	7.5	65 TO 69
29	6.0	70 TO 74
39	8.1	75 TO 79
38	7.9	80 TO 84
47	9.8	85 TO 89
41	8.5	90 TO 94
31	6.5	95 TO 99
81	16.9	100 TO 104
8	1.7	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




94
94
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

95

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1210   60   64    4    1
  12395     115200  480
  61  60  62  62  71  60  61  60  63  65  61  65  62  61  79  83
  85  91  90  92  91  96  98 101  96  92  95  92  99  93  99  99
  90  89  87  93  94  96  97  97  96  81  93  98  96 101  99  94
 100 100  97  99  98  99  95  87  91  96  91  96  95  89  94  95
  97  91  97  99  97  99  79  82  96  99  98  96  97  95  92  98
  89  98  97  95  98  90  91  91  91  93  95  92  97  95  96  96
  98  92  93  84  85  82  82  70  76  82  92  86  90  95  88  91
  97  96  93  93  93 100  95  97  92  96  92  94  91  92  86  82
  92  93  90  91  95  95  94  96  93  93  97  95  96  93  83  81
  92  96  92 101 112  88  94  98  95  96  96  95  93  88  88  84
  90  80  85  91  94  94  89  92  89  81  91  96  96  94  95 100
  96  87  81  76  81  92  96  91  83  86  86  91  96  92  91  89
  60  60  67  63  89  92  89  80  84  94  93  95  88  96  92  92
  91  92  80  84  93  79  66  80  96  96  88  89  97  98  95  96
  90  93  91  92  92  91  92  86  79  77  65  68  62  67  62  61
  64  86  80  67  67  80  64  62  71  72  73  82  95  88  90  94
  88  81  87  93  91  88  85  85  85  91  88  80 100  78  87  88
 107  87  84  98  86  96  90  92  96 114 113 113 114 111  87  84
  84  90  98  96  92  94  95  94  95 102 102  98  83  89  89  90
  97  95  83  92 100  96  94  89  97  95  91  92  78  67  63  61
  60  67  67  65  61  88  68  98  99  92  93  95  96  88  62  85
  92  92  97  99  97  93  96  99  99  90  78  75  70  68  71  87
  71  63  74  90  72  76  96  97  84  94 100  96  96  98  98  90
  62  60  63  66  60  60  60  61  60  64  68  66  61  60  90  90
  90  77  75  94  98  99  98  94  98  92  64  76  90  94  66  70
  69  64  87  94  92  85  70  74  72  76  74  78  72  72  71  78
  76  83  98  95  92  86  60  60  83  81  71  97  94  95  64  63
  60  73  78  77  60  60  71  60  74  72  72  76  75  73  77  77
  78  77  80  65  75  64  64  60  60  60  66  60  60  84  94  93
  92  95  95  88  96  95  95  97  94  95  96  96 102  92  96  94
%EOF
```

95

```
ENTER LOG DATE (DD/MM/YR) : 20/08/79

ENTER SITE CODE (5 CHARS) : 00307
ENTER USER CODE (4 CHARS) : 4362
 ENTER JOB CODE (3 CHARS) : TEL
```

```
   DATA LOGGED :20  AUG 1979          DATA ANALYZED : 25 SEPT 1979
        LOGGER : DB-301/26                SITE CODE : 00307
 SERIAL NUMBER : 1216                      JOB CODE : TEL
      BASELINE : 90 DB                   USER CODE : 4362
 DYNAMIC RANGE : 54 DB                    THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STANDBY TIME =  0:51:38
```

TIME HISTORY ANALYSIS

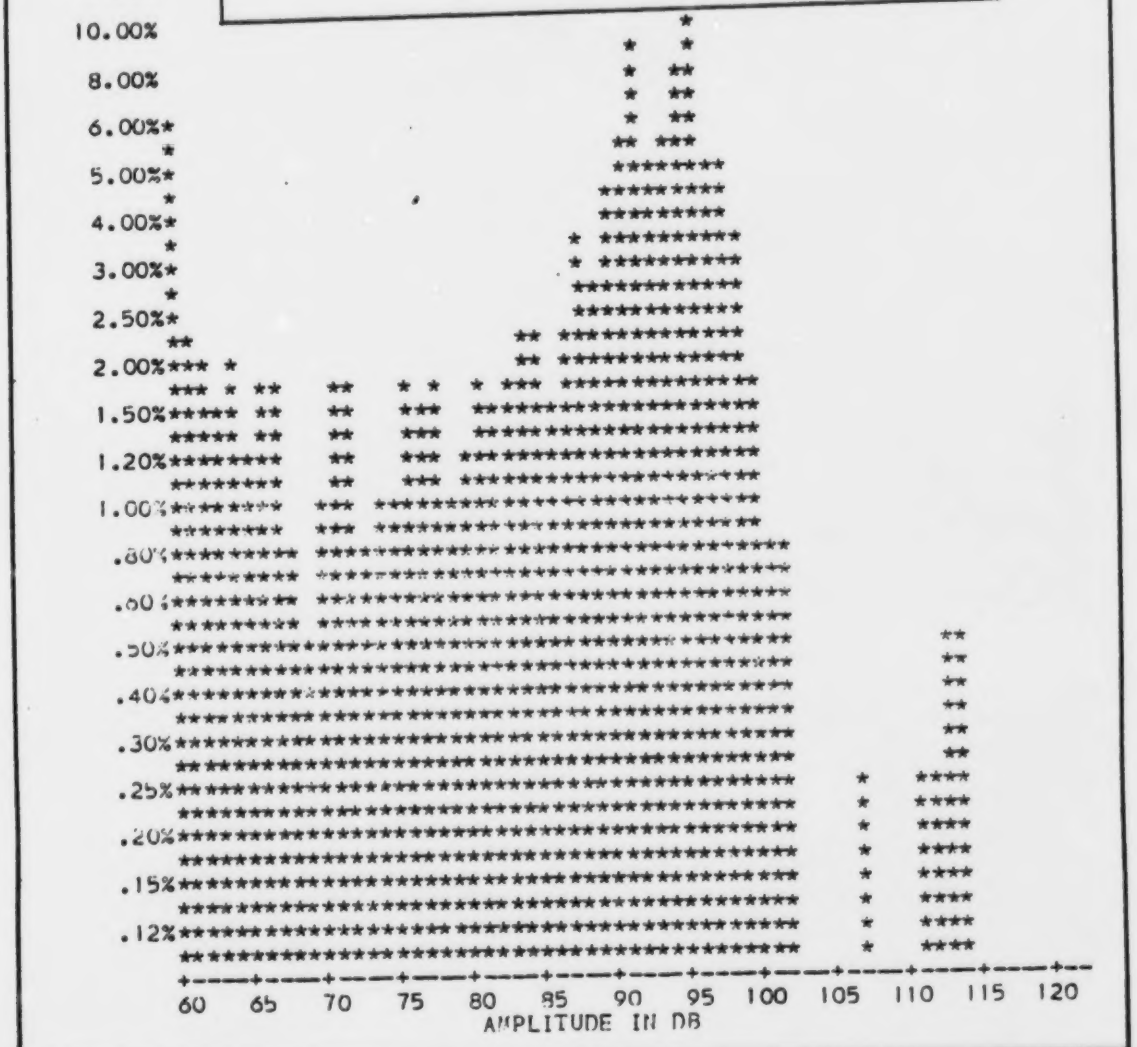
```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
TOUR DAYS  =  7 DAYS / WEEK
EXCHANGE (DOUBLING) RATE = 6 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

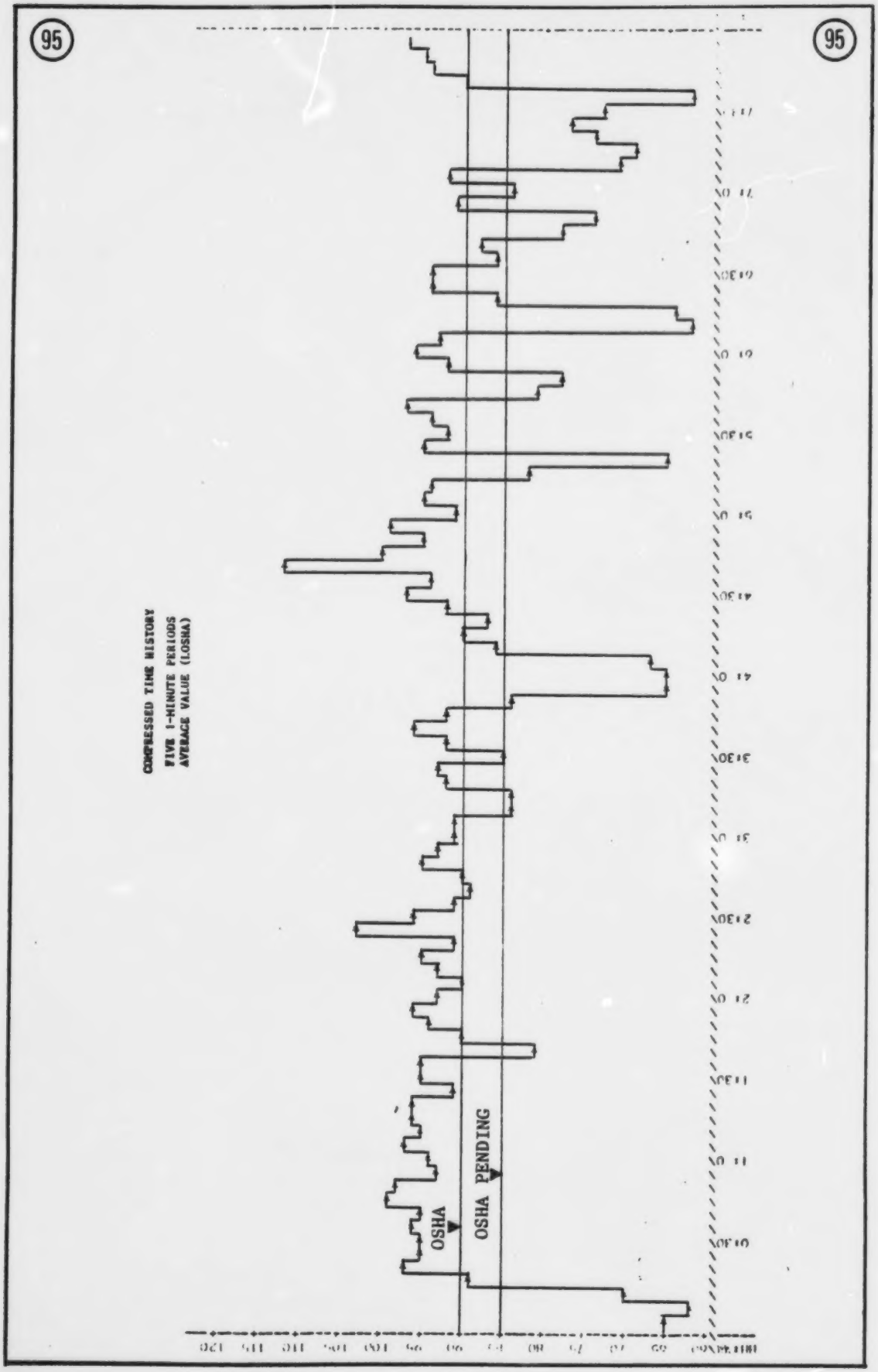
TIME	LEQ(A		SENEL	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	93.5	93.5	20.348	20.35
2	94.2	93.9	22.308	42.65
3	94.4	94.0	22.922	65.57
4	89.7	93.2	12.090	77.63
5	98.5	94.6	40.460	118.09
6	91.4	94.1	15.215	133.30
7	89.1	93.6	11.002	144.30
8	88.0	93.1	10.261	154.56

```
MIN. COMP. =  60 DB                MAX. COMP. = 114 DB
ARITHMETIC MEAN =  95 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```

95

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
57	11.9	60 TO 64
24	5.0	65 TO 69
25	5.2	70 TO 74
28	5.8	75 TO 79
34	7.1	80 TO 84
50	10.4	85 TO 89
116	24.4	90 TO 94
124	25.8	95 TO 99
13	2.7	100 TO 104
1	.2	105 TO 109
6	1.3	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




95
95
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

96

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1215     60     64      4      1
     92      115200   480
  62  60  66  61  60  60  60  61  60  70  60  60  60  62  62  60
  60  62  60  66  63  60  60  62  60  60  60  60  60  60  60  72
  81  63  83  90  94  95  95  94  94  94  93  93  94 103 104 103
 104 102 106 103 101  99  87  60  60  60  60  60  60  60  60  62
  61  60  60  90  93  94  96 102 105  98  60  91  91 100 103  92
  97 103 [illegible]
  99  80  [illegible]
 101 102 [illegible]
  89  90  98 103  98 102  93  99  95  88  87  88  90  85  92 100
 103 [illegible]
 110 109 110 109 110 111 113 110 [illegible]
 106 105 107 105 105 105 105 105 105 105 105 100  83  71  75  80
  77  81  76  80  85  77  [illegible]
  83  82  78  87  80  77  73  78  [illegible]
 105 103 104 104 103 103 103 103 102 102 100  99 106 106 109 [illegible]
 105 106 107 106 101 107 103 107 109 [illegible]
  93 104 106 107 108 107 107 107 107  98  90  86  78 105 [illegible]
 108 108 107 108 108  91 106 106 106 106 106 106 105  97  83  95
 104 109 108 107 107 103 106 107 107 106 106 106 105 105 105 105
 107 103  97 105 106 106 105 105 101  86  98  65  41  60  60  60
  60  60  60  60  60  60  77 100  [illegible]
  62  60  61  60  60  60  60  60  60  60  62  60  60  60  89 101
 103  94  79  91  90  60  66  65  65  60  76  65  62  64  63  64
  60  60  94  92  91  91  92  93  92  72  65  60  60  60  60  61
  63  60  60  60  60  60  60  60  60  60  60  63  60  60  60  60
  60  60  60  60  60  60  64  60  66  60  60  60  60  60  60  60
  60  64  66  60  66  60  61  60  60  60  60  94  93  92  93  94
  94  94  94  93  88  60  83  99 100  95  91  99  97  96  91  71
  68  65  79  95  95  89  87  68  60  75  63  61  65  85  95  99
  94  92  99  87  89  86  96  94  85  63  60  60  60  60  62  60
$EOF
```

96

```
ENTER LOG DATE (DD/MM/YR) : 16/07/79
ENTER SITE CODE (5 CHARS) : 00210
ENTER USER CODE (4 CHARS) : 4560
 ENTER JOB CODE (3 CHARS) : 273
```

```
    DATA LOGGED :16 JULY 1979          DATA ANALYZED : 13 SEPT 1979
         LOGGER : DS-301/26                SITE CODE : 00210
  SERIAL NUMBER : 1217                      JOB CODE : 273
       BASELINE : 96  38                   USER CODE : 4560
  DYNAMIC RANGE : 96  01                   THRESHOLD : 80
  SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 1152 00
  TEST DURATION = [illegible]          STANDBY TIME  = [illegible]
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
[illegible]
THRESHOLD (PENCILED) LEVEL = [illegible]
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

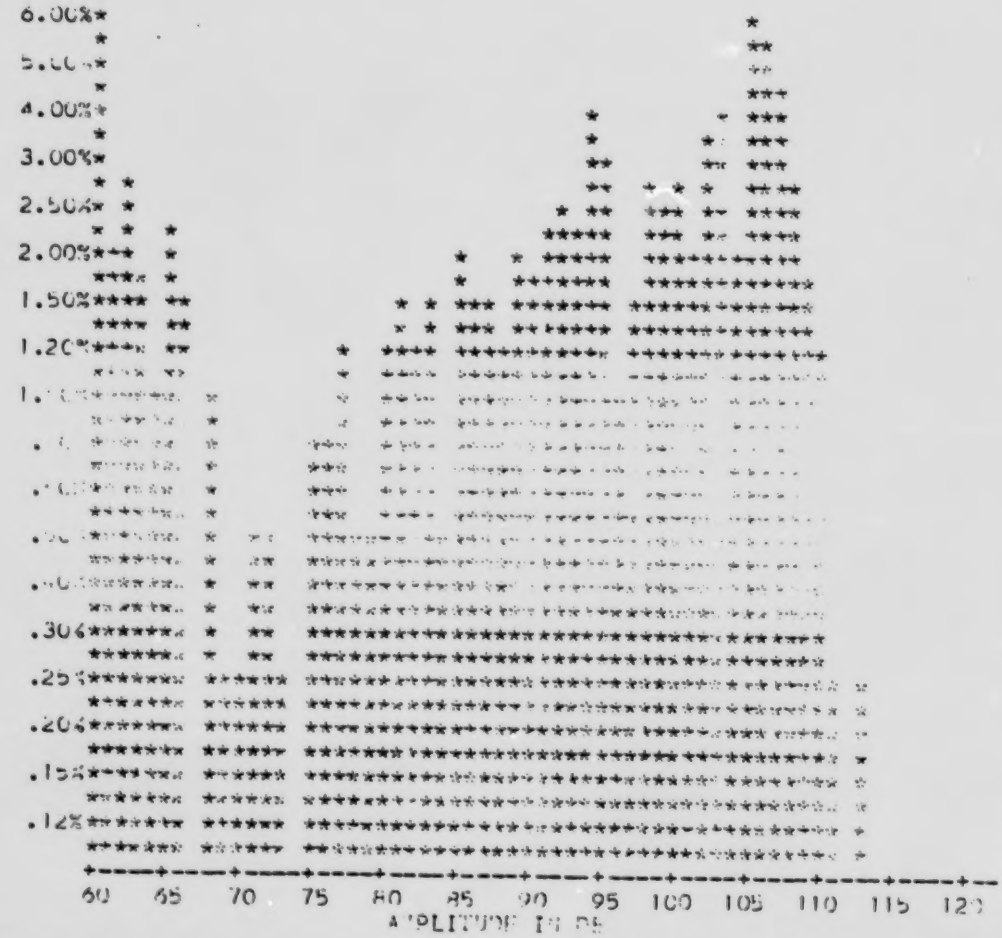
TIME	LEQ		SEL	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	91.4	91.4	15.222	15.22
2	94.5	93.1	23.353	38.58
3	103.5	96.4	81.638	120.12
4	99.4	98.7	25.819	146.94
5	109.3	100.6	104.705	270.64
6	99.2	99.9	25.438	296.28
7	77.6	99.3	2.210	298.51
8	90.3	98.2	13.024	311.54

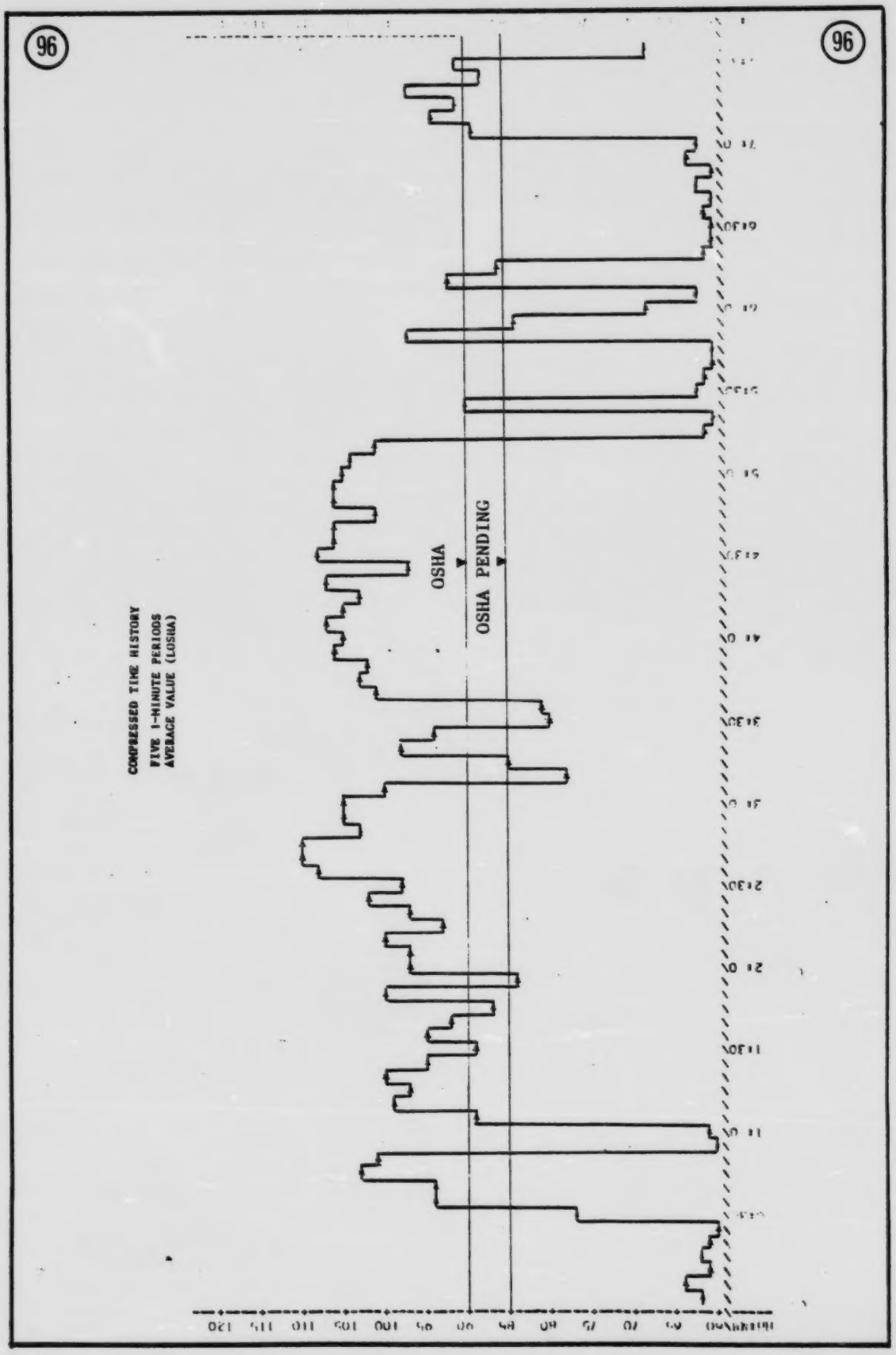
MIN. COMP. = 60 00 MAX. COMP. = 114 00
ARITHMETIC MEAN = 84 38
STD. DEVIATION = 18 09
VARIANCE =324 16

96 AMPLITUDE DISTRIBUTION 96

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
139	29.0	60 To 64
20	4.2	65 To 69
6	1.3	70 To 74
15	3.1	75 To 79
24	5.0	80 To 84
33	6.9	85 To 89
51	10.6	90 To 94
43	9.0	95 To 99
57	11.9	100 To 104
85	17.7	105 To 109
7	1.5	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




96
96
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
120
115
110
105
100
95
90
85
80
75
70
65
60

(97)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
1 26 80 1225 60 64 4 1
96 115200 480

70	60	64	67	65	61	67	65	66	78	80	71	88	91	91	96
95	93	98	103	106	104	104	102	102	103	100	102	94	103	101	94
94	94	94	94	94	94	94	94	94	94	94	94	98	100	107	94
92	93	98	106	97	97	96	99	95	92	103	103	96	96	86	86
86	87	87	99	97	93	100	100	93	93	93	93	93	93	93	93
93	93	93	97	106	94	94	94	93	93	94	94	94	94	94	93
95	100	104	101	95	102	103	104	102	93	60	66	0	78	98	95
84	90	92	95	101	100	103	92	94	104	102	101	101	103	104	94
86	85	81	83	86	87	87	86	86	87	87	87	87	87	86	87
87	87	87	87	87	87	87	87	87	87	92	95	103	106	103	103
101	103	105	104	106	100	94	87	87	103	105	100	101	73	62	65
70	74	64	63	67	67	62	62	59	60	99	104	102	92	90	95
75	75	87	99	93	95	96	91	93	88	91	91	91	92	91	93
98	95	103	106	92	105	115	116	115	114	116	115	115	113	114	112
113	113	113	107	113	107	106	107	106	108	95	90	92	92	90	92
93	94	91	101	106	107	108	109	111	114	113	111	110	110	110	113
91	107	109	108	111	113	112	112	109	110	114	114	105	105	111	113
114	112	114	108	108	110	110	110	110	110	102	93	91	91	87	84
85	89	84	85	94	87	84	91	95	97	91	93	93	97	73	63
66	70	71	60	60	60	60	60	60	60	61	60	7	70	61	76
60	60	60	66	60	60	60	60	72	90	101	100	101	106	104	98
105	103	101	112	106	99	92	95	103	104	106	99	86	74	77	63
63	64	67	70	98	102	95	89	90	99	104	104	100	94	93	106
103	105	89	88	89	102	104	101	104	104	104	103	97	90	90	98	104
102	98	96	99	99	94	94	94	100	103	103	101	105	104	107	98
98	94	95	96	95	98	102	102	101	104	101	85	96	96	85	86
87	87	94	87	87	104	104	103	102	102	103	104	104	104	104	100
100	101	102	98	99	102	102	102	102	102	102	102	101	102	100	99
99	100	109	102	105	106	108	97	109	105	107	92	93	92	91	94
96	104	104	93	101	103	100	101	100	89	94	95	103	104	103	97

EOF

ENTER LOG DATE (DD/MO/YR) : 17/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : /762
ENTER JOB CODE (3 CHARS) : 271

DATA LOGGED :17 JULY 1979
LOGGER : DR-301/26
SERIAL NUMBER : 1225
BASELINE : 60 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8 HR 0 MIN

DATA ANALYZED : 13 SEPT 1979
SITE CODE : CC210
JOB CODE : 271
USER CODE : 7762
THRESHOLD : 90 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 0 HR 0 MIN

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOGGER MODEL = DR-301/26
EXCHANGE (DOUBLE) RATE = 4 DB
THRESHOLD (CUTOFF) LEVEL = 90 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME BLOCK	LEQ(A) CURRENT	LEQ(A) CUMULATIVE	SEL CURRENT	SEL CUMULATIVE
1	97.2	97.2	34.107	34.11
2	96.0	96.6	28.652	62.76
3	96.3	96.5	28.791	91.54
4	100.9	100.2	113.385	204.90
5	107.6	102.4	143.476	350.76
6	95.9	101.7	28.137	378.92
7	99.4	101.4	47.293	426.21
8	101.8	101.5	54.067	480.28

MIN. COMP. = 60 DB
MAX. COMP. = 116 DB
ARITHMETIC MEAN = 93 DB
STD. DEVIATION = 14 DB
VARIANCE =196 DB

(97)

97

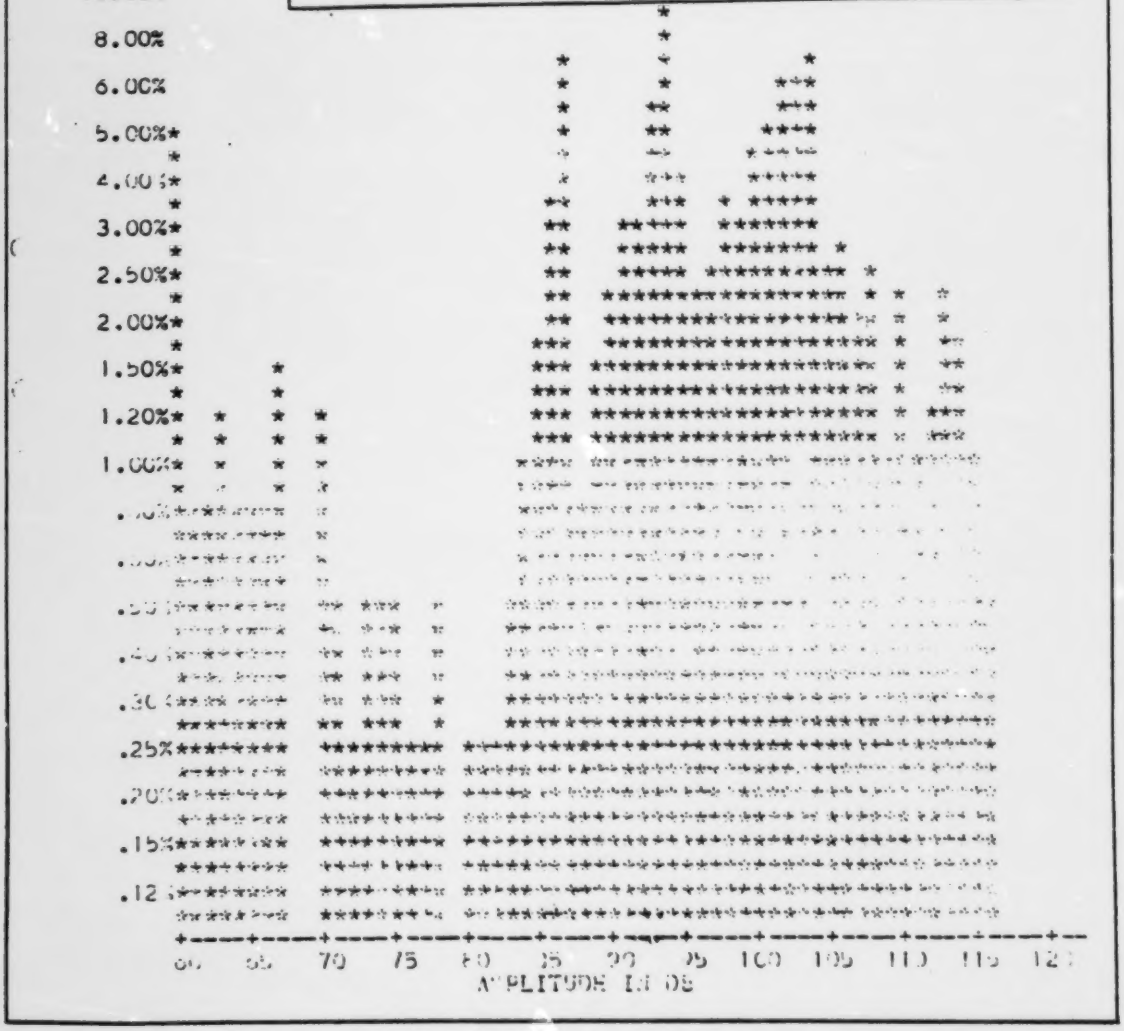
AMPLITUDE DISTRIBUTION

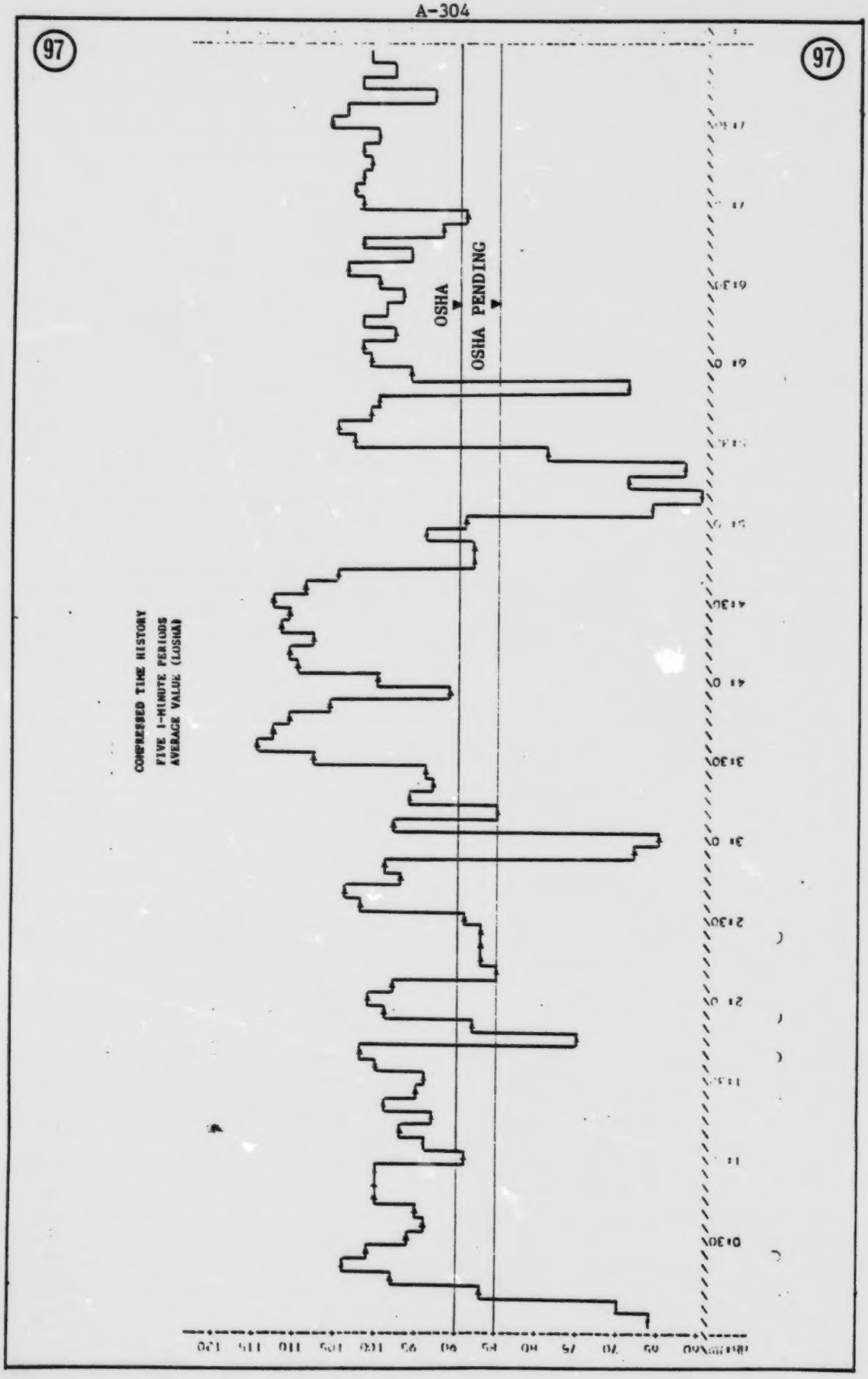
97

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
34	7.1	60 TO 64
12	2.5	65 TO 69
12	2.5	70 TO 74
6	1.3	75 TO 79
9	1.9	80 TO 84
57	11.9	85 TO 89
93	19.4	90 TO 94
61	12.7	95 TO 99
113	23.5	100 TO 104
43	9.0	105 TO 109
34	7.1	110 TO 114
6	1.3	115 TO 119

TOTAL NO. OF DATA POINTS = 480




97
97
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
0:30
1:
1:30
2:
2:30
3:
3:30
4:
4:30
5:
5:30
6:
6:30
7:
7:30
65
70
75
80
85
90
95
100
105
110
115
120

98

PLACE TAPE IN DRIVE 1 AND TYPE A <SPACE> WHEN READY

1 76 50 1221 61 64 4 1
13572 119290 440
70 62 60 60 60 60 60 60 62 60 60 60 60 60 60 60
60 60 60 60 60 61 60 63 60 76 70 73 73 66 62 61
63 73 62 60 64 69 74 75 64 66 61 60 60 69 66 73
69 67 79 79 73 73 61 67 85 93 85 83 78 [illegible]
79 76 73 76 72 68 69 75 73 73 72 72 70 73 72 75
75 73 7[illegible] 74 93 100 [illegible]
[illegible]
[illegible]
104 99 111 115 113 111 [illegible] 105 114 114 113 111 [illegible]
111 [illegible]
111 111 [illegible] 93 93 [illegible] 113 97 [illegible]
[illegible]
[illegible]
114 112 114 [illegible] 97 104 114 112 115 113 113 [illegible] 112 112 11[illegible]
111 93 105 112 115 91 114 115 112 110 95 [illegible] 111 101 [illegible] 117
[illegible]
71 66 66 72 63 67 63 62 67 63 67 76 [illegible]
[illegible]
112 112 111 114 105 102 [illegible]
[illegible]
[illegible]
66 89 100 92 100 99 96 87 86 87 87 88 86 [illegible]
93 90 99 87 89 87 88 87 88 88 89 89 92 95 91 94
93 92 93 93 93 97 97 97 93 92 93 95 93 94 93 [illegible]
119 120 103 119 105 94 95 95 95 95 95 95 95 93 94 [illegible]
97 96 96 96 96 96 97 96 97 97 95 96 96 95 [illegible]
95 96 96 95 94 97 99 96 93 95 94 [illegible]
90 93 92 95 92 86 86 86 86 86 87 86 85 85 86 [illegible]
87 87 87 89 94 97 99 102 99 95 89 96 97 99 97 [illegible]
$EOF

ENTER LOG DATE (DD/MM/YR) : 21/07/79
ENTER SITE CODE (5 CHARS) : 45050

ENTER USER CODE (4 CHARS) : [illegible]

ENTER JOB CODE (3 CHARS) : 251

DATA LOGGED 24 JULY 1979
[illegible]

DATA ANALYZED : 17 [illegible]
[illegible]
: 281
: 1880
: 8
[illegible]

[illegible]

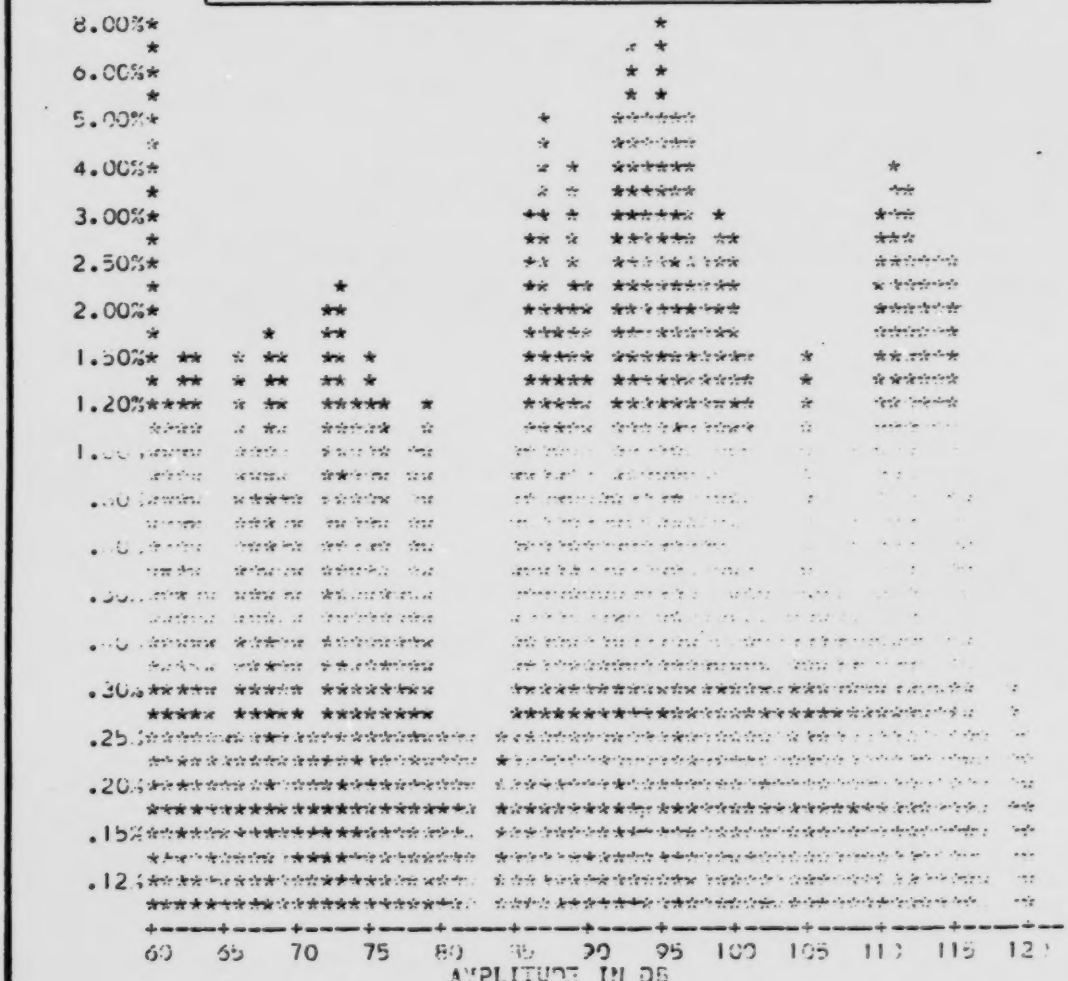
[illegible]
[illegible]
[illegible]

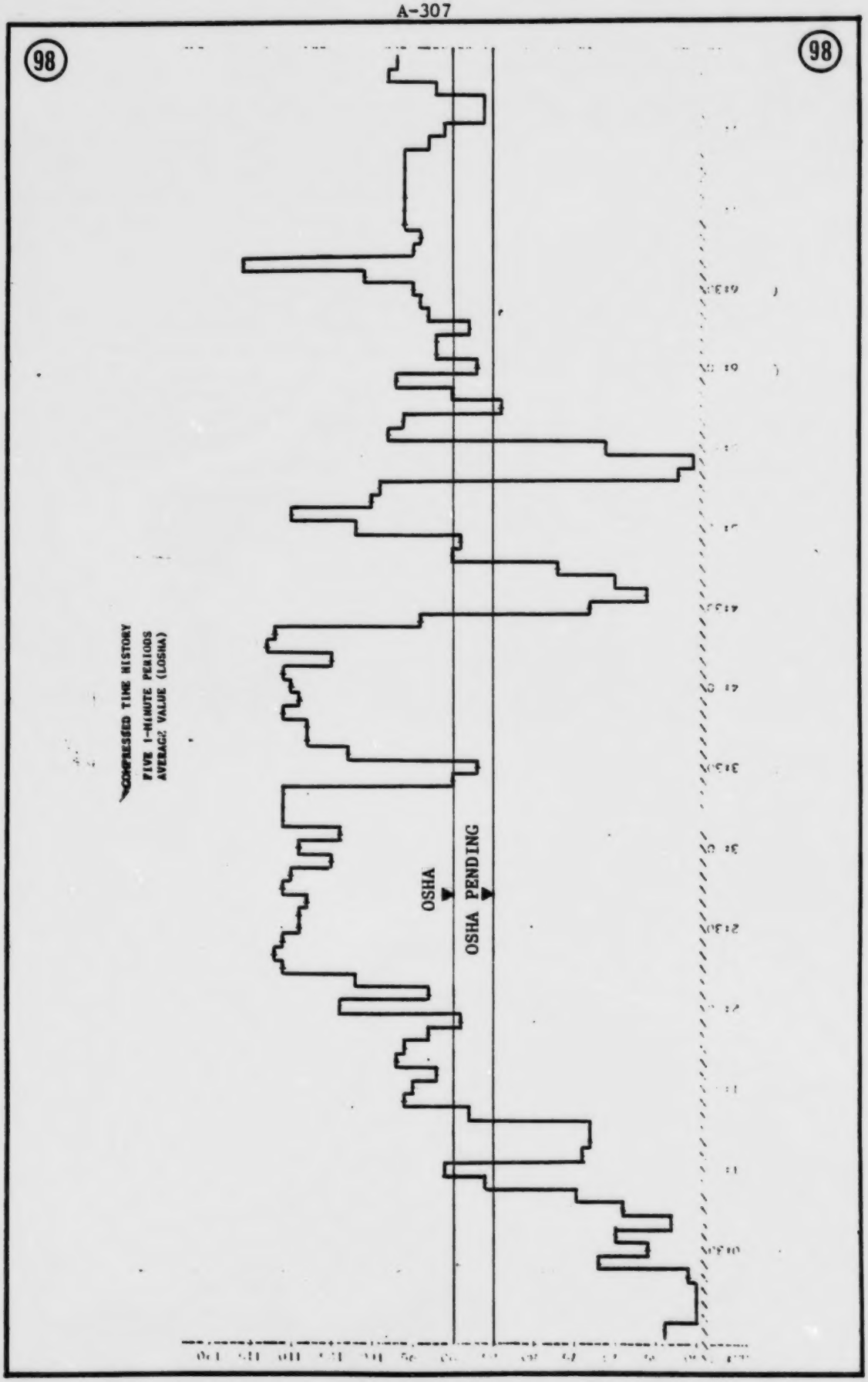
98

AMPLITUDE DISTRIBUTION

98

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
52	10.9	60 TO 64
24	5.0	65 TO 69
26	5.4	70 TO 74
22	4.6	75 TO 79
4	.8	80 TO 84
61	12.7	85 TO 89
79	16.5	90 TO 94
92	19.2	95 TO 99
25	5.2	100 TO 104
16	3.3	105 TO 109
62	12.9	110 TO 114
16	3.3	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




98
98
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

99

```
PLACE CARD IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1   26   30  1216     60     64     4     1
    8433      115200   480
 60  60  60  62  60  60  60  60  60  60  61  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  63  60  68  63  73  60
 60  60  60  60  61  60  60  60  60  64  60  60  62  60  62  62
 60  68  72  65  69  78  72  64  68  60  79  91  82  72  81  88
 97  79  78  77  69  72  75  79  68  74  73  77  79  72  77  75
 80  78  81  79  80  78  78  87  85  85  86  83  83  85  86  82
 86  85  86  85  86  85  84  86  86  85  86  86  86  86  86  85
 85  85  86  87  85  84  85  85  85  89  91 100 101 107  92  92
 91  91  91  91  91  91  91  95 108  93 113 111 109 102 106 113
111 107 101 104 108 113 111 103  92  93 109 112 112 108  94  92
111 109  92  95 111 109  91 104 110 111 105 106 111 104 105  94
107 103  92  91  95 105 109 109 112 100  91  91  89 106 101
110  89 111 111 109 106  92  97 110 111 111 103  90  90  92  90
100  91 102 107  86  98  83  84  60  63  74  86  83  90  85  84
 87  92  93  89 108  99 108 106  98 111 102 108 103  99 109 105
 89  89  90  64  69  77  92 108 107 110 105 111 105 102 104 103
108 106  92  93  85  73  96  99  83  79  75  77  75  77  79  76
 76  77  80  78  76  68  65  67  68  81  77  75  79  78  80  83
 63  80  80  78  88 100  99  73  60  60  60  63  85  60  60 104
105 111 111 108 111 111 111 106  91 106 111 112 112 110  99 110
110 110 102  91  91  91  94  85  87 100 108  89  85 105 105 106
104 105 107 103 107  87  96 109 111 109  72 107 112  99  70  75
 66  89  79  72 107 104 102 111  82  76  93 101  77 104 112 109
113 101 112 109 106 113 108  83  83  77  76  88  78 100 103 101
 88  92  60  71  91  90  94  88  94  88  94  90  95  85  62  63
 75  92  98  60  60  60  60  61  60  60  60  69  65  72  95  89
 83  84 109 108  81  80  84  83  86  89  82  77 104 107 103 110
 82  64  66  71  77 113 108  84  76  75  83 101  94  90  93  98
 97  92  97  96  98 101  85  87 101  86  75  72  77  71  76  67
 82  84  85 100 100  90  61  62  76  64  63  61  77  62  63  66
%EOF
```

99

```
ENTER LOG DATE (DD/MM/YR) : 24/07/79

ENTER SITE CODE (5 CHARS) : SCHST
ENTER USER CODE (4 CHARS) : 4735
 ENTER JOB CODE (3 CHARS) : 296
```

```
   DATA LOGGED :24 JULY 1979                DATA ANALYZED : 17 SEPT 1979
        LOCATION : SC-301/26                    SITE CODE : SCHST
  CHANNEL NUMBER : 1216                         JOB CODE : 296
      BASELINE : 60 %                           USER CODE : 4735
 DATA TO ANALYZE : 24 HR                     CHANNEL NUMBER :
  SAMPLING RATE : 4/SEC                    TOTAL SAMPLES =  11520
 TEST DURATION =  80 MIN                     START AT    =   0000
```

TIME HISTORY ANALYSIS

```
DATA ACQUISITION [ SEC (or min) CALCULATION
NUMBER OF DATA POINTS =
TIME INCREMENT (DELTA T) =
ANALYSIS (OCTAVE) LEVEL = 20 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

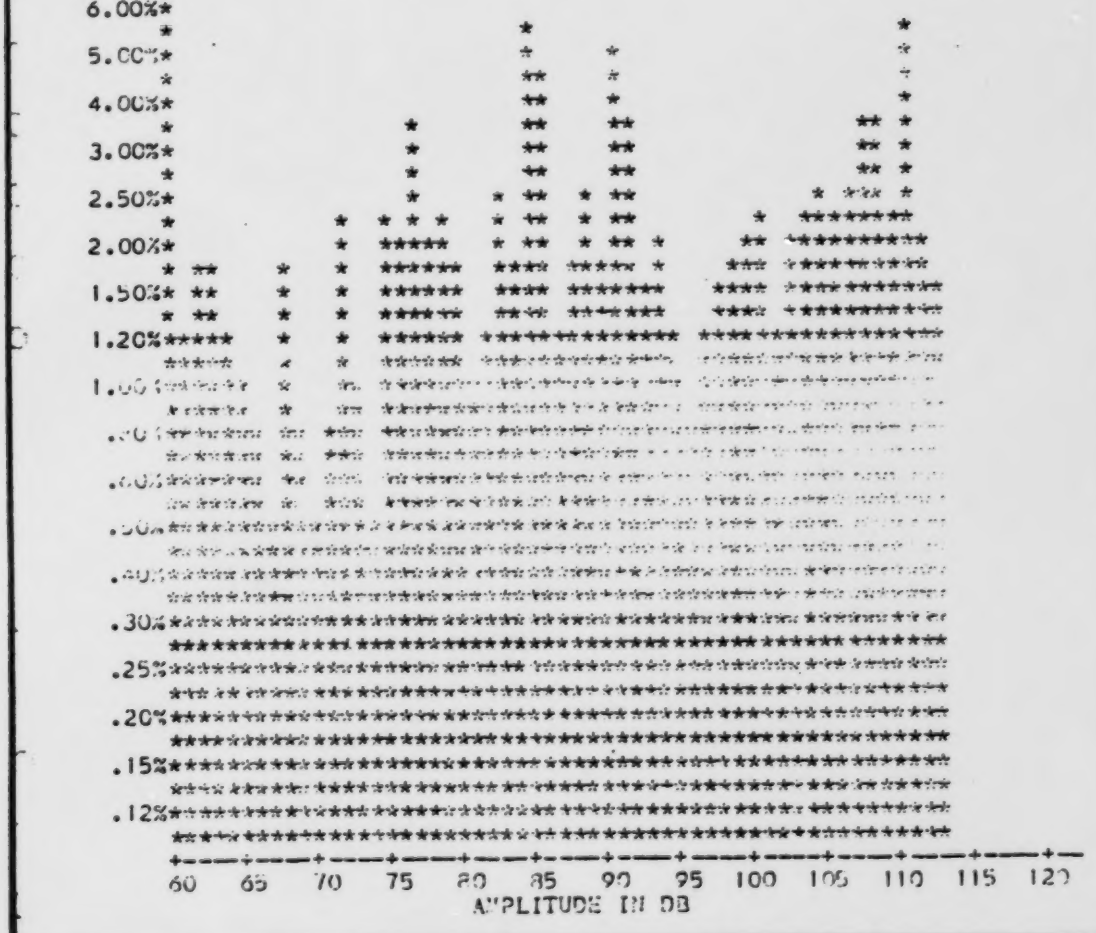
BAND	CENTER FREQUENCY	RELATIVE	SPECTRAL	CUMULATIVE
1	64.1	69.1	.398	.60
2	88.4	91.4	5.47	6.07
3	122.1	94.1	12.68.1	118.03
4	168.4	94.7	7.173	191.03
5	232.4	94.2	31.367	222.40
6	320.2	100.5	102.71	325.11
7	441.5	100.4	45.277	371.10
8	609.4	100.0	29.577	399.25

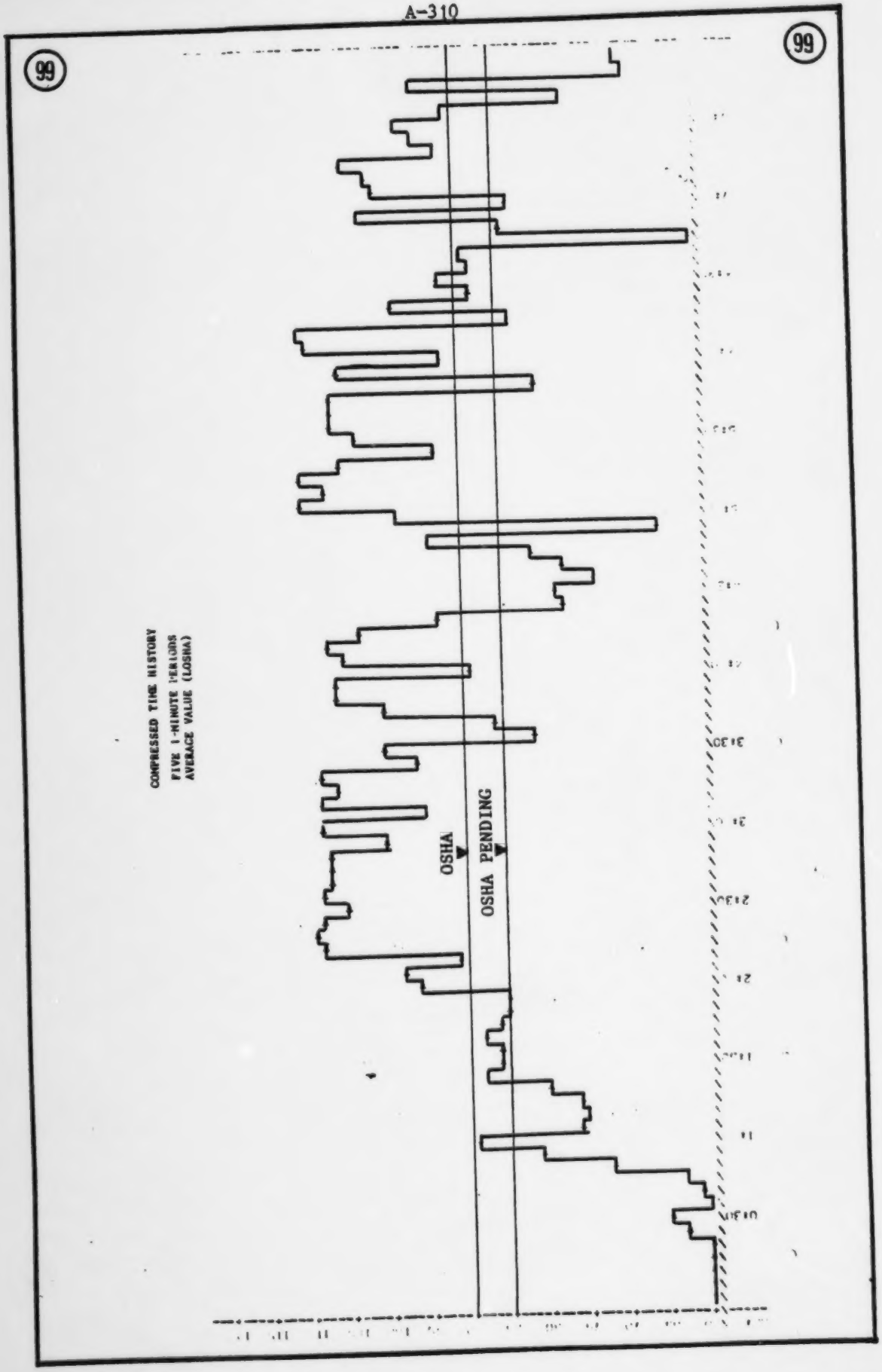
```
SAMPLE SIZE =  96 PTS                    MAX. SPEC. = 111 DB
ARITHMETIC MEAN =  90 DB
SAMPLE VARIANCE =  12
STANDARD =
```

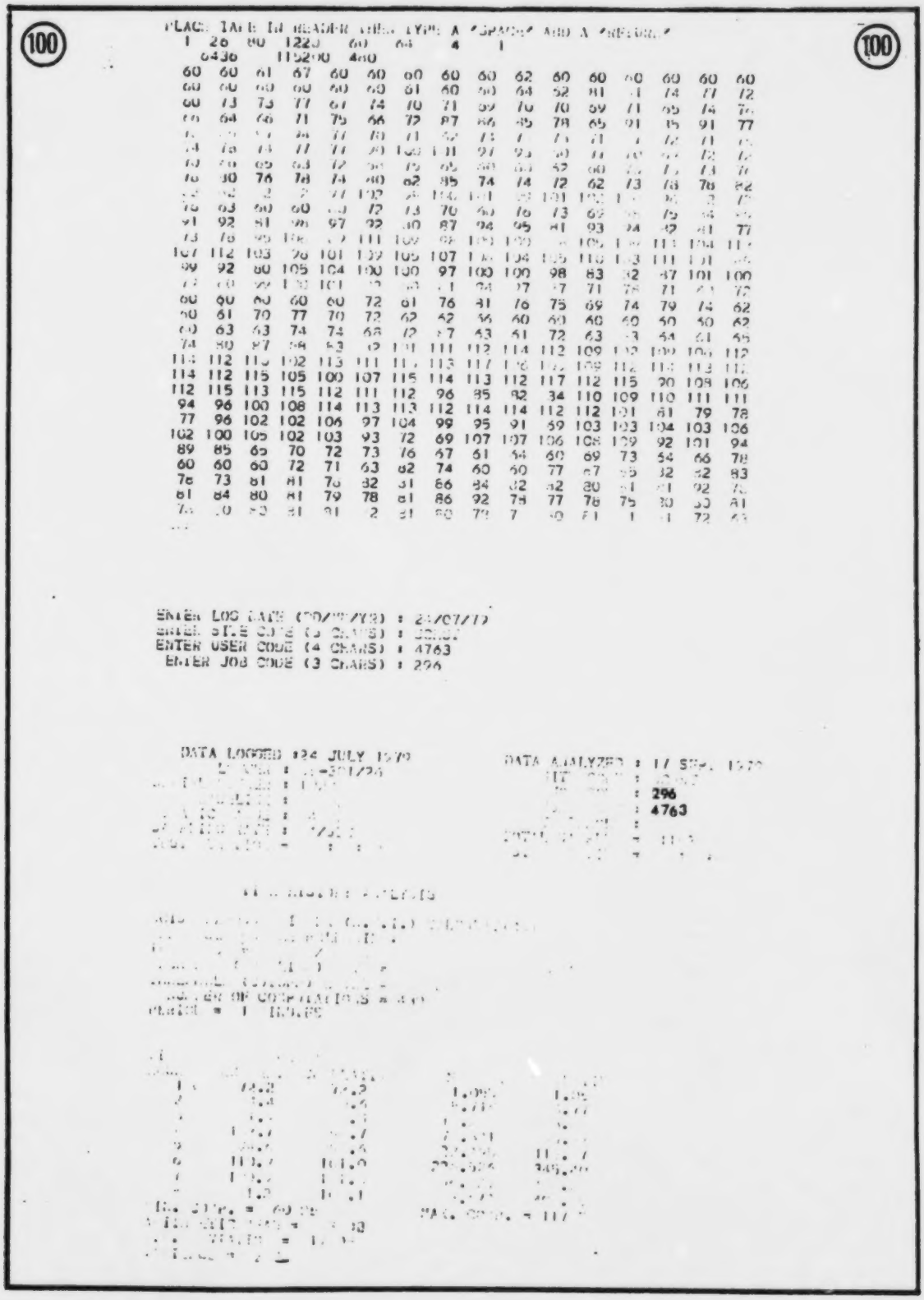
AMPLITUDE DISTRIBUTION

99 99

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
77	16.0	60 To 64
19	4.0	65 To 69
20	4.2	70 To 74
48	10.0	75 To 79
33	6.9	80 To 84
62	12.9	85 To 89
54	11.3	90 To 94
26	5.4	95 To 99
39	8.1	100 To 104
57	11.9	105 To 109
45	9.4	110 To 114
0	0.0	115 To 119
TOTAL NO. OF DATA POINTS = 480		




99
99
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING



100

PLACE TAPE IN READER WITH TYPE A "SPACE" AND A "RETURN"

1 26 80 1220 60 64 4 1

0436 115200 480

60 60 61 67 60 60 60 60 60 62 60 60 60 60 60 60
60 60 60 60 60 60 61 60 60 64 62 81 61 74 77 72
60 73 73 77 67 74 70 71 69 70 70 69 71 65 74 74
66 64 66 71 75 66 72 87 86 85 78 65 91 85 91 77
[illegible]
[illegible]
[illegible]
76 80 76 78 74 80 82 95 74 74 72 62 73 78 78 82
[illegible]
78 83 80 80 [illegible] 72 73 70 [illegible] 76 73 69 [illegible] 72 [illegible]
91 92 81 [illegible] 97 92 [illegible] 87 94 95 81 93 [illegible] 89 81 77
[illegible]
107 112 103 [illegible] 101 [illegible] 105 107 [illegible] [illegible] 110 [illegible] 111 [illegible]
99 92 80 105 104 100 100 97 100 100 98 83 82 87 101 100
[illegible]
80 80 80 80 80 72 81 76 81 76 75 69 74 79 74 62
80 81 70 77 70 72 62 62 66 60 60 60 60 60 60 62
60 63 63 74 74 66 72 67 63 61 72 63 [illegible] 64 61 65
74 80 87 [illegible] 83 [illegible] [illegible] 111 112 114 112 109 [illegible] [illegible] [illegible] 112
[illegible] 112 [illegible] 102 113 111 [illegible] 113 117 [illegible] [illegible] 109 [illegible] [illegible] [illegible]
114 112 115 105 100 107 115 114 113 112 117 112 115 90 108 106
112 115 113 115 112 111 112 96 85 82 84 110 109 110 111 111
94 96 100 108 114 113 113 112 114 114 112 112 101 81 79 78
77 96 102 102 106 97 104 99 95 91 89 103 103 104 103 106
102 100 105 102 103 93 72 69 107 107 106 108 109 92 101 94
89 85 69 70 72 73 76 67 61 64 60 69 73 54 66 78
60 60 60 72 71 63 82 74 60 60 77 87 85 82 82 83
78 73 81 81 76 82 81 86 84 82 82 80 81 81 92 76
81 84 80 81 79 78 81 86 92 78 77 78 75 80 80 81
[illegible] 80 83 81 81 2 81 80 79 7 [illegible] 81 1 81 72 [illegible]

ENTER LOG DATE (DD/MM/YR) : 24/07/79
ENTER SITE CODE (3 CHARS) : JOHN
ENTER USER CODE (4 CHARS) : 4763
ENTER JOB CODE (3 CHARS) : 296

DATA LOGGED ON 24 JULY 1979

[illegible]

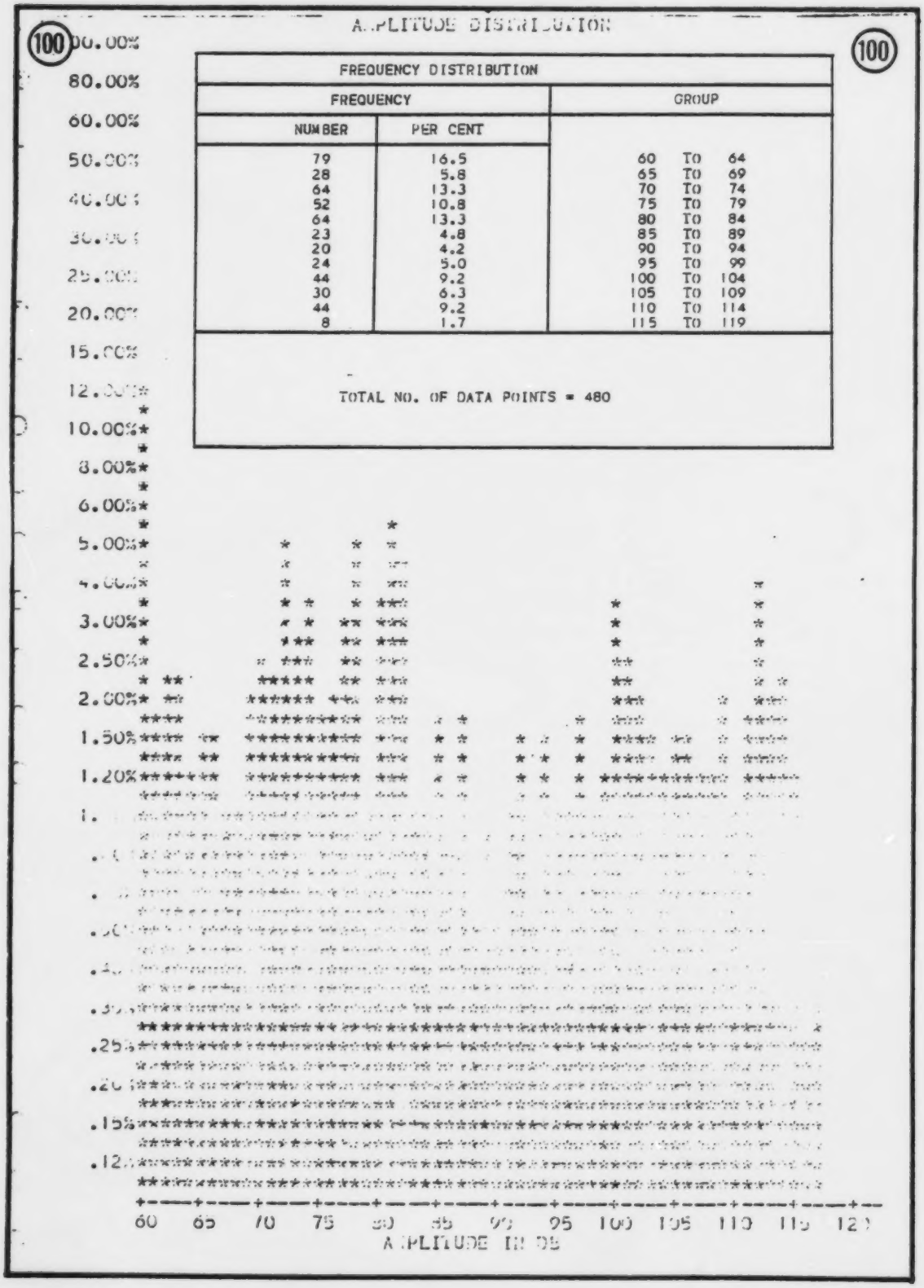
DATA ANALYZED : 17 SEP 1979
[illegible] : JOHN
[illegible] : 296
[illegible] : 4763
[illegible]

[illegible]

[illegible]

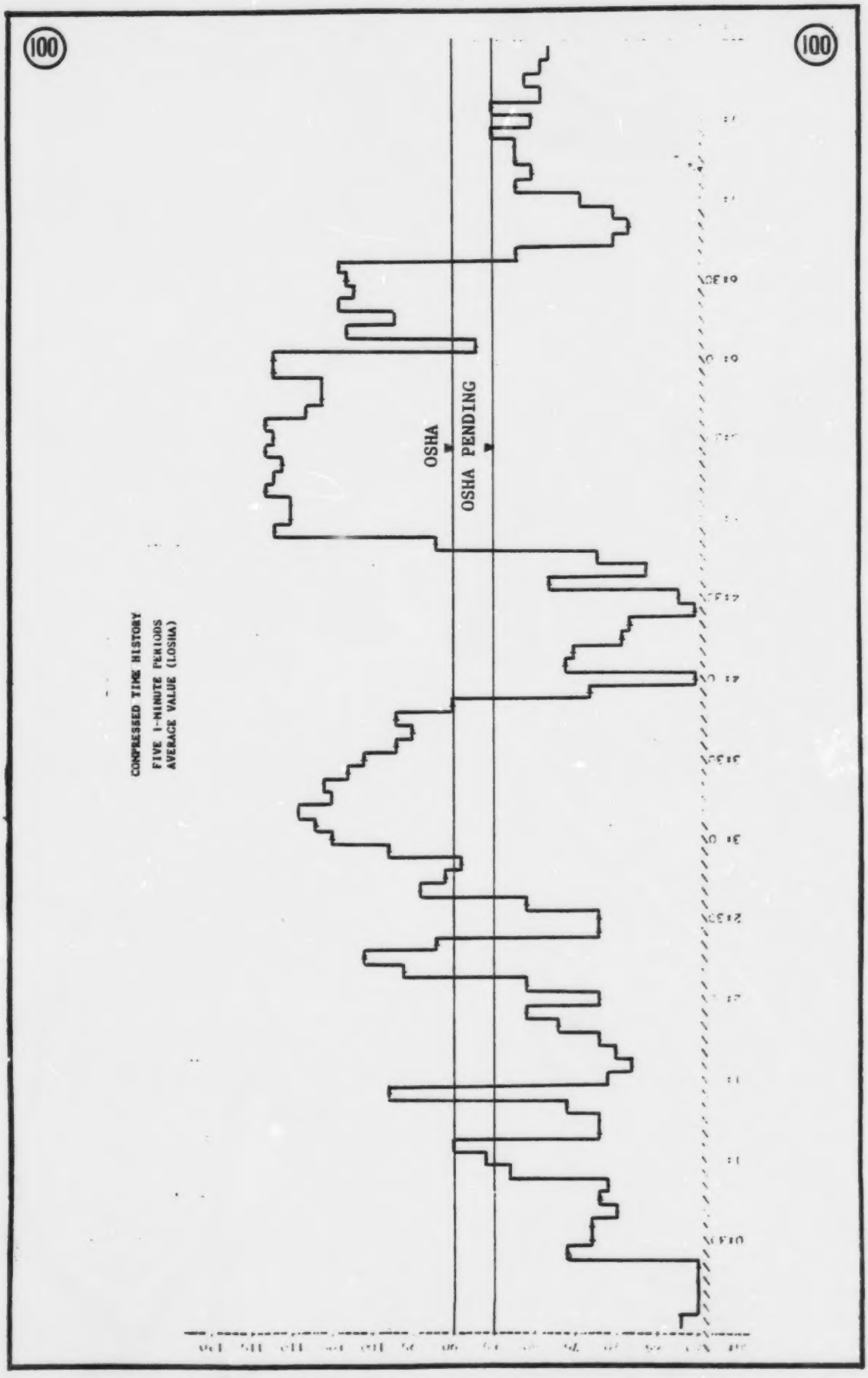
[illegible]

[illegible]



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
79	16.5	60 TO 64
28	5.8	65 TO 69
64	13.3	70 TO 74
52	10.8	75 TO 79
64	13.3	80 TO 84
23	4.8	85 TO 89
20	4.2	90 TO 94
24	5.0	95 TO 99
44	9.2	100 TO 104
30	6.3	105 TO 109
44	9.2	110 TO 114
8	1.7	115 TO 119

TOTAL NO. OF DATA POINTS = 480


100
100
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(101)

PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'

(101)

```
  1  26  80  1219   60   64    4    1
    /506     115200  480
 63  60  60  60  60  60  60  61  60  60  60  60  60  60  60  60
 60  60  74  70  80  79  71  75  75  80  74  79  78  73  74  68
 72  77  75  83  82  70  79  78  69  73  76  73  80  80  72  78
 77  80  76  90  87  87  84  82  72  93  97  81  75  72  86  90
 90  80  73  71  67  78  77  80  81  76  80  81  82  83  84  78
 81  85  90 102 101  96  95  82  76  83  82  80  87  82  83  77
 72  64  66  73  61  69  71  76  79  69  70  74  68  62  68  72
 61  79  91  95 100  88  96 103  90  76 101  96  98  94 102 101
101 101 103  97  94 101  88  71  60  65  60  60  60  60  60  72
 74  74  72  69  66  66  60  73  77  70  76 109 105 111 102 110
113 113 110  96 111 117 116 102 113  84  84  87  86  86  86 117
113 103 119 117 117 105 111  88  91 111 109  92  92  85 106 112
111 108  94 108 112  98  83  94  91  93  91  83  83  84  89  87
 89 103 101 103  87 103 106  83   4  93 106 112 117 111 107 115
119 114 109 117 117 105  91  90  93  88 102 116 119 111 109 111
100 108  82  83 101 112 116 114 113 101  93  91  91  88 102 110
101 106 107  92  95 101  86  84  79  74  71  68  73  71  65  65
 71  65  61  66  62  63  64  65  75  71  68  77  73  76  81  75
 74  73  78  93  99 100  90  81  82  83  82  81  81  94 100 110
112 109 116 116 119 117 110 120 120 114 117  92 116 118 118 115
 93 118 117 117 114 118 101 115 115 112 107 103 106 102  92  99
 92 104 115 111 103 105 103  96  88  86  92  91  84  93  84  93
 84  83  84  91  86  92  91  77  82  85  82  74 107 107 106 107
 99 109  98 107 102  86  73  65  68  85  73  69 100 102  67 109
103  71 107 103 103 108 102 107 101 108 103 105  74  80  72  92
104  94  81  76  60  60  66  63  63  65  86 101 101 103 103 106
 97 101 101  98  98  98  98  98  98  98  98  96  98  98  98  98
 98  98  98  96 104  76  74  74  60  67  88  62  63  64  60  65
 61  60  69  65  75  78  84 101 100  82  60  60  62  55  61  66
 61  73  70  73  66  63  74  73  66  61  75  78  46  46  75  62
%EOF
```

```
ENTER LOG DATE (DD/MM/YR) : 24/07/79

ENTER SITE CODE (5 CHARS) : SChST

ENTER USER CODE (4 CHARS) : 4718
 ENTER JOB CODE (3 CHARS) : 296
```

```
   DATA LOGGED :24 JULY 1979
        LOGGER : DL-301/24
SERIAL [illegible] : 1219
     GAIN LEVEL : 1 %
 SAMPLING RATE : 4 Hz
SAMPLING PERIOD : 4/SEC
TOTAL SAMPLES = [illegible]
```

```
DATA ANALYZED : 17 SEPT 1979
     SITE CODE : SCUST
     JOB CODE  : 296
     USER CODE : 4718
[illegible]
TOTAL DATA PTS = 115200
[illegible]
```

```
          .I'M HISTORY ANALYSIS

[illegible] SAMPLES (= .I.) GOLD PLATED
[illegible]
[illegible]
[illegible] (= .I.) . .. =
[illegible] (GOLD) [illegible]
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	79.0	79.0	2.737	2.74
2	80.1	80.9	9.412	12.35
3	[illegible]	[illegible]	[illegible]	[illegible]
4	107.3	[illegible]	[illegible]	[illegible]
5	99.1	[illegible]	[illegible]	[illegible]
6	110.7	[illegible]	291.677	924.00
7	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]

```
[illegible] = [illegible]
[illegible] = [illegible]
[illegible] = 17
[illegible] = [illegible]
```

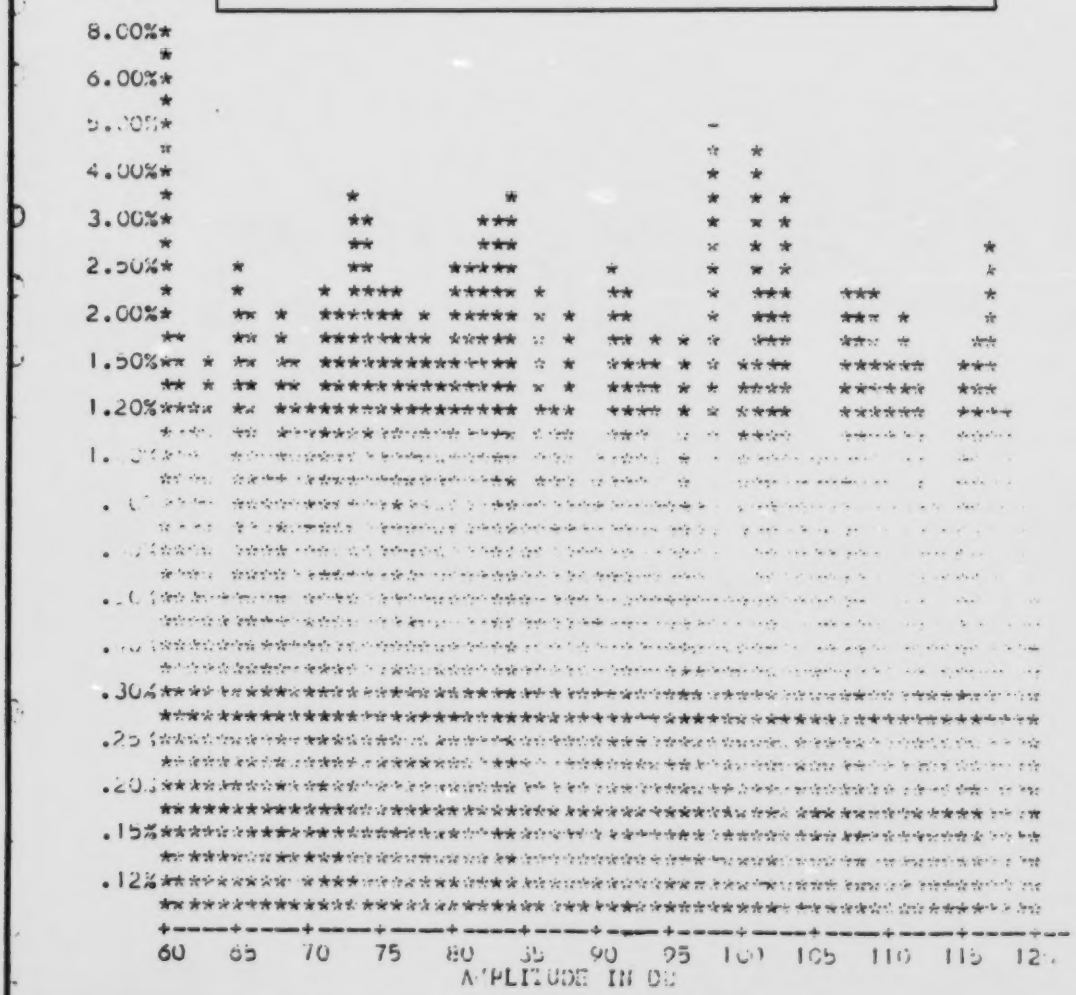
AMPLITUDE DISTRIBUTION

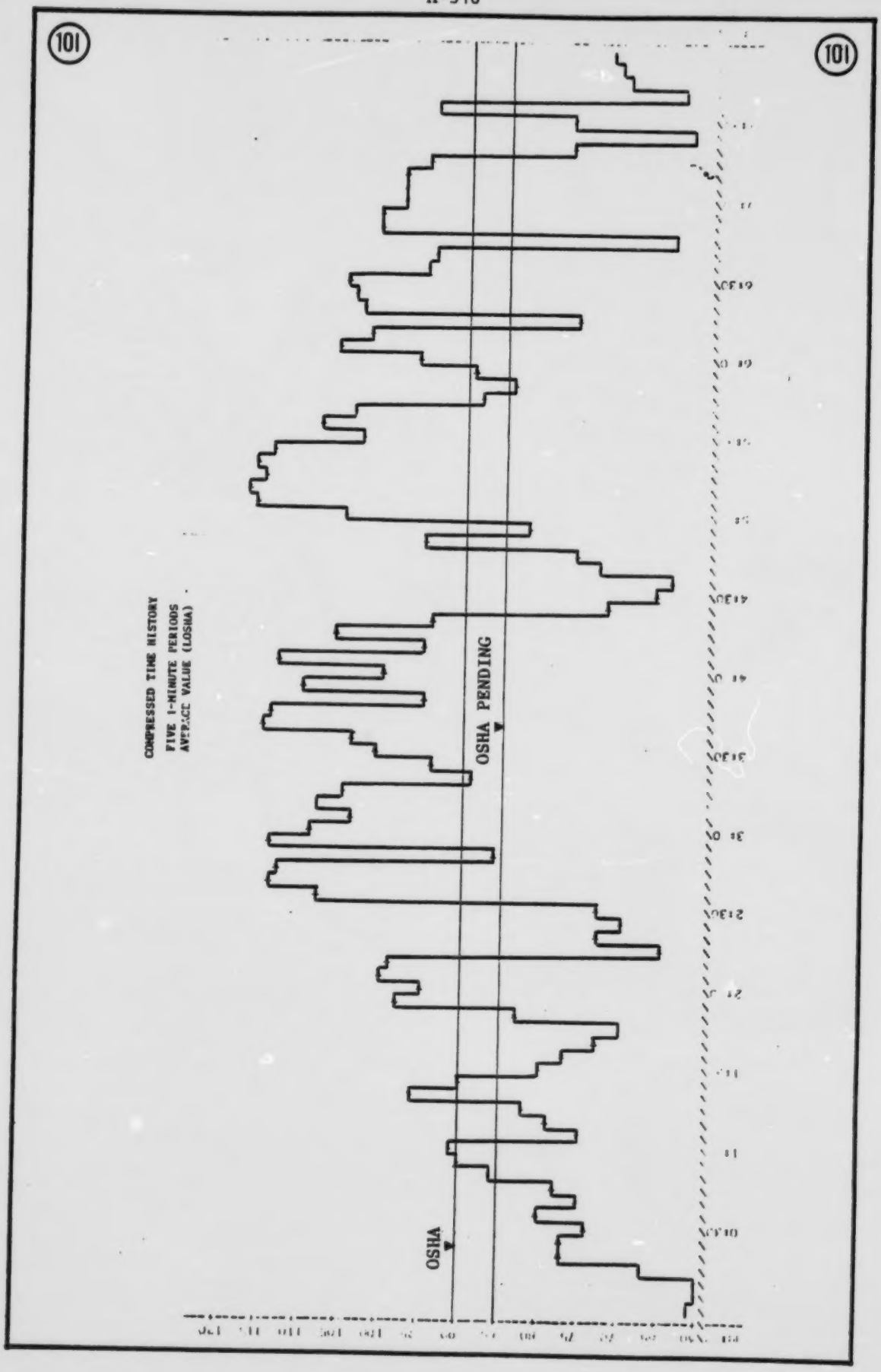
(101)

FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
50	10.5	60 TO 64
36	7.5	65 TO 69
49	10.3	70 TO 74
39	8.2	75 TO 79
61	12.8	80 TO 84
28	5.9	85 TO 89
36	7.5	90 TO 94
35	7.3	95 TO 99
51	10.7	100 TO 104
35	7.3	105 TO 109
26	5.4	110 TO 114
32	6.7	115 TO 119

TOTAL NO. OF DATA POINTS = 480




101
101
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA PENDING
OSHA

(102)

```
 1  26  80  121*   60   64    4    1
   4930      11520  480
 73  64  60  61  60  68  61  60  61  60  60  60  64  60  60  60
 69  64  60  62  60  62  63  60  62  63  61  61  67  69  77  64
 67  72  75  61  63  66  63  66  67  67  69  67  68  72  69  73
 71  66  75  69  63  65  64  74  66  90  85  86  85  84  84  90
 70  65  87  90  62  79  87  99  99  70  67  71  74  74  69  69
 72  68  75  72  92  71  73  77  74  98  97  93  94  98  90  90
 ..  ..  ..  ..  ..  ..  ..   1  ..  ..  ..  ..   1  ..  ..   1
 92  91  ..  ..  ..  90  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 71  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 99 101 103 103  95  89  89  ..  87  87  ..  89  93  ..  ..  ..
 ..  ..  ..  ..   1  ..  ..  ..  ..   1  ..  ..  ..  ..   1  ..
 ..  ..  ..  ..   1  89  ..  89  ..   1  87  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 89  89  98 103 102  94  88  92  96  93  87  89  87  87  87  86
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 73  73  ..  73  71  74  ..  72  ..  64  72  ..  ..  ..  ..  ..
 73  73  75  78  75  83  79  76  76  78  ..  ..  96  96  95  95
 97  95  91  89  93  99  94  95  ..  93  ..  ..  ..  ..  ..  ..
 97  97  94  97  94 100  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 96  94  94  ..  88  90 104 102  94  ..  ..  ..  90  90  90  ..
 89  90  94  89  93  89  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
100  97  92  91  ..  92  ..  91  ..  92  92  97  ..  ..  ..  ..
 90  91  92  94  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 97  ..  91  92  ..  98  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 90  90  91  93  90  93  92  ..  95  ..  ..  97  ..  ..  ..  ..
%EOF
```

(102)

ENTER LOG DATE (DD/MM/YR) : 24/07/79
ENTER SITE CODE (5 CHARS) : SCHST
ENTER USER CODE (4 CHARS) : 4719

ENTER JOB CODE (3 CHARS) : 296

DATA LOGGED :24 JULY 1979
LOGGED : [illegible]
[illegible] : 121
[illegible] : [illegible]
[illegible] : [illegible]
[illegible] : [illegible]
[illegible] : [illegible]

DATA ANALYZED : 17 SEPT 1979
[illegible] : [illegible]
[illegible] : 296
[illegible] : 4719
[illegible] :
[illegible] : [illegible]
[illegible] = [illegible]

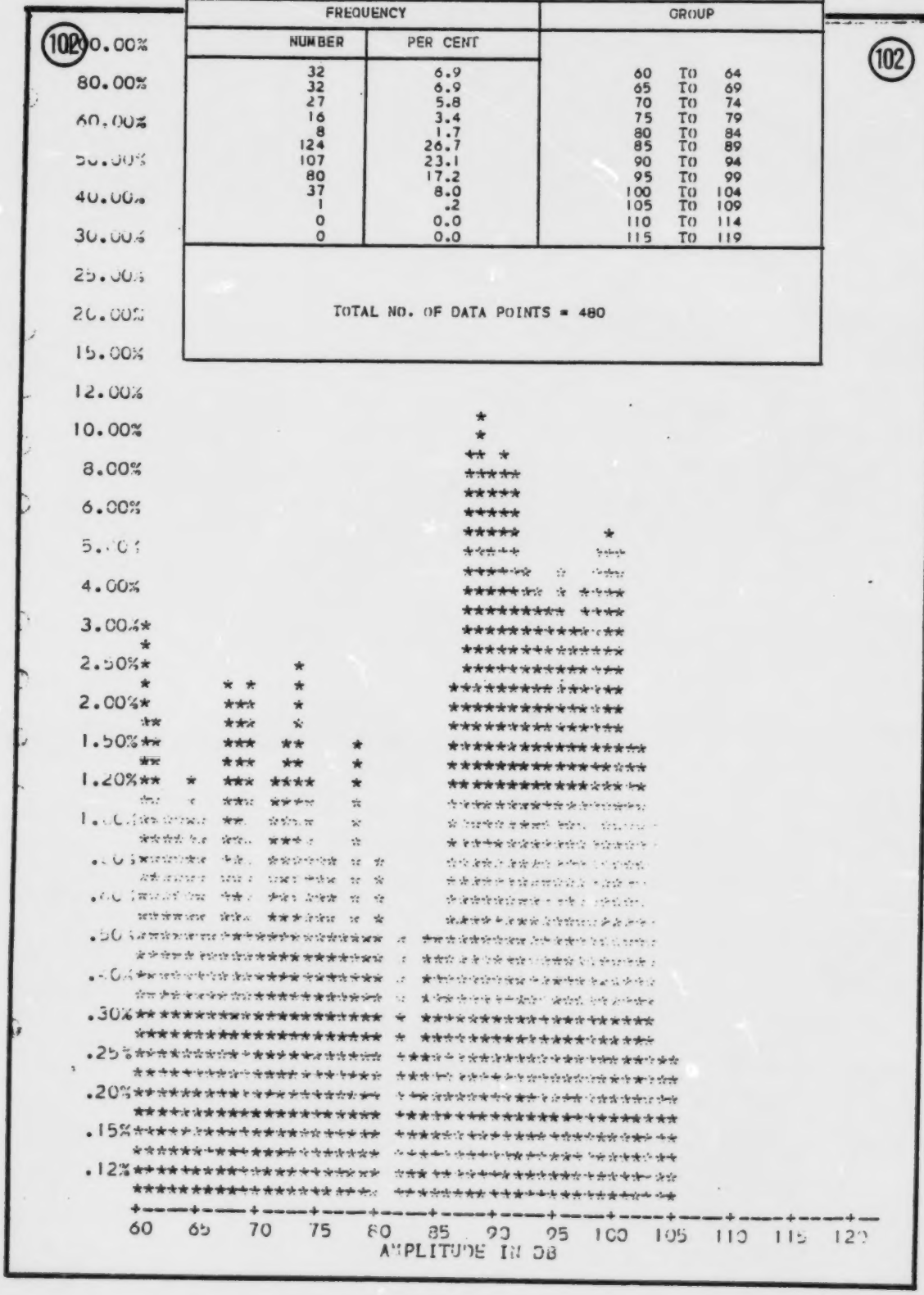
[illegible] ANALYSIS

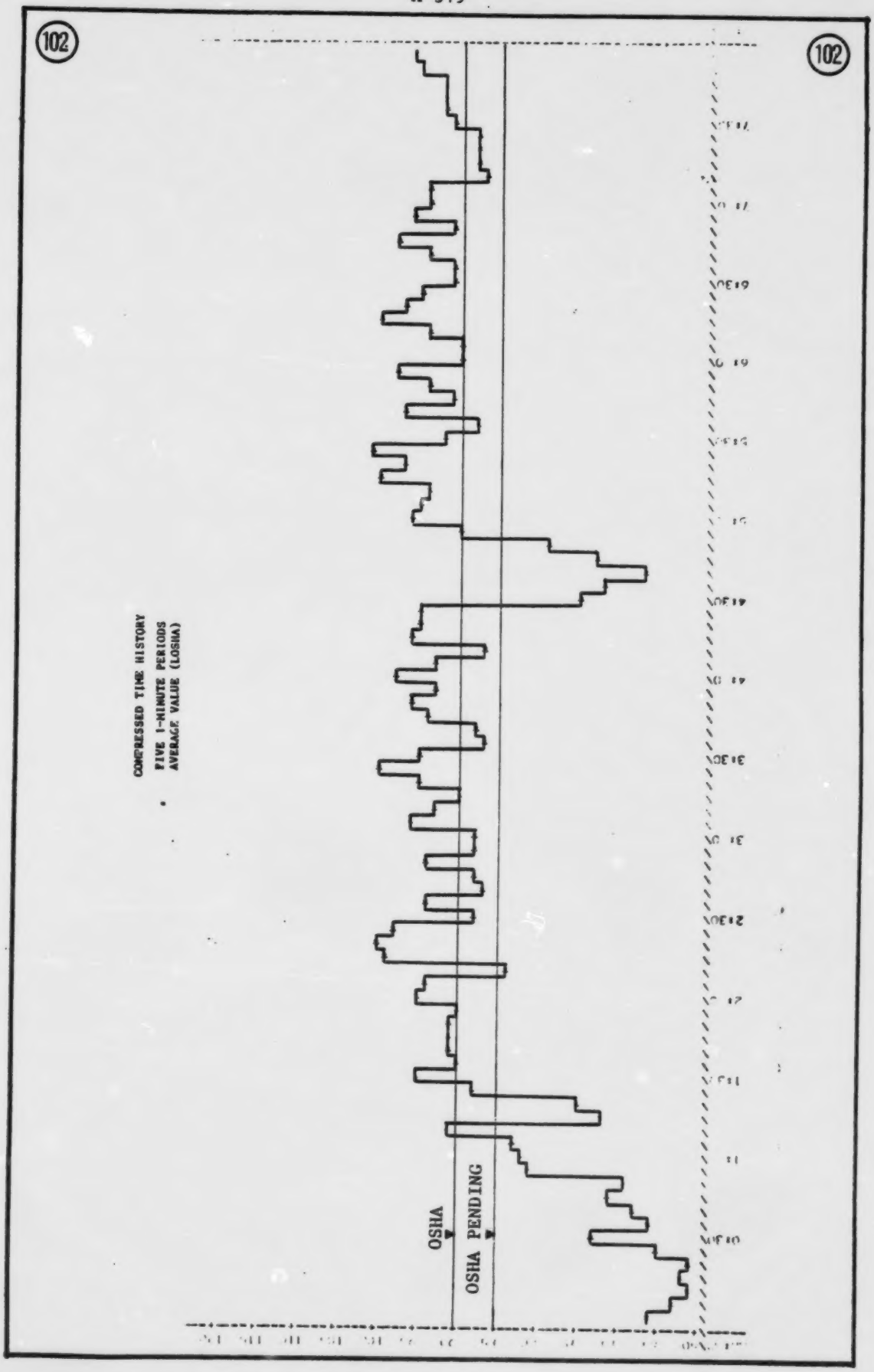
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	69.9	69.9	.769	.77
2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]
5	90.9	[illegible]	[illegible]	[illegible]
6	96.1	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]

MIN. COEF. = [illegible] [illegible] = [illegible]
ARITHMETIC [illegible] = [illegible]
STD. DEVIATION = [illegible]
VARIANCE = [illegible]

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
32	6.9	60 TO 64
32	6.9	65 TO 69
27	5.8	70 TO 74
16	3.4	75 TO 79
8	1.7	80 TO 84
124	26.7	85 TO 89
107	23.1	90 TO 94
80	17.2	95 TO 99
37	8.0	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




102
102
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(103)

```
 64  60  60  60  61  61  67  61  60  60  60  60  61  61  63  60
 60  63  63  60  60  60  60  61  61  61  63  60  61  66  67  70
 74  70  71  65  67  63  72  65  61  60  61  62  61  60  61  64
 64  69  68  71  73  70  67  74  76  65  67  68  72  67  71  74
 80  79  81  85  83  85  91  74  76  74  75  72  76  73  76  73
 69  73  74  77  74  78  76  77  74  81 101  99  98  96  95  87
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
101 100  97  96  77  82  83  81  86  85  84  86  86  85  81  87
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 97 100 107 105 102 101 103  99  99 107 105 101 106 103  99 104
103 106 104  95  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 78  73  69  73  80  80  80  80  80  72  82  86  83  75  70  70
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 66  66  62  60  70  72  80  80  89  85  87 103 107 108 107 104
 93 102  90 106 107 107 104  93 106 107 107 107 110 106  96 104
103 112 109 111 109 110 110 107  97  97 104 110 106 106 110 104
111 106 106  97 109 111 112 106  ..  ..  ..  ..  ..  ..  ..  ..
111  96 112  97 100  82  91  96  77  80  87  86  89  82  91 110
104  75  86  78  89  96 100 112 110 107 105 111  99  96  76 101
111 105 110 110 105 109 107 112 107 101  80  82  97  85  83  83
 82  75  89  98  95  91  83  75  78  77  84  83  80  80  77  81
 61  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 65  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  61  60  82  84  86  74  60  60  60  66  73  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
%EOF
```

(103)

ENTER LOG DATE (DD/MM/YR) : 24/07/79

ENTER SITE CODE (5 CHARS) : SCHST

ENTER USER CODE (4 CHARS) : 4729
ENTER JOB CODE (3 CHARS) : 296

DATA LOGGED :24 JULY 1979
LOGGED : -24/24
: 1224
:
:
: 24/ 0
= :

DATA ANALYZED : 17 SEPT 1979
:
:
: 296
: 4729
:
=

[illegible]

[illegible]

NO ... OF OBSERVATIONS = 480
PERIOD = 1 HOURS

1	65.9	65.9	.469	.24
2	[illegible]	.0	.77	[illegible]
3	[illegible]	.1	[illegible]	[illegible]
4	[illegible]	.0	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	.0	[illegible]	[illegible]
7	[illegible]	.0	[illegible]	[illegible]
8	[illegible]	.0	[illegible]	[illegible]

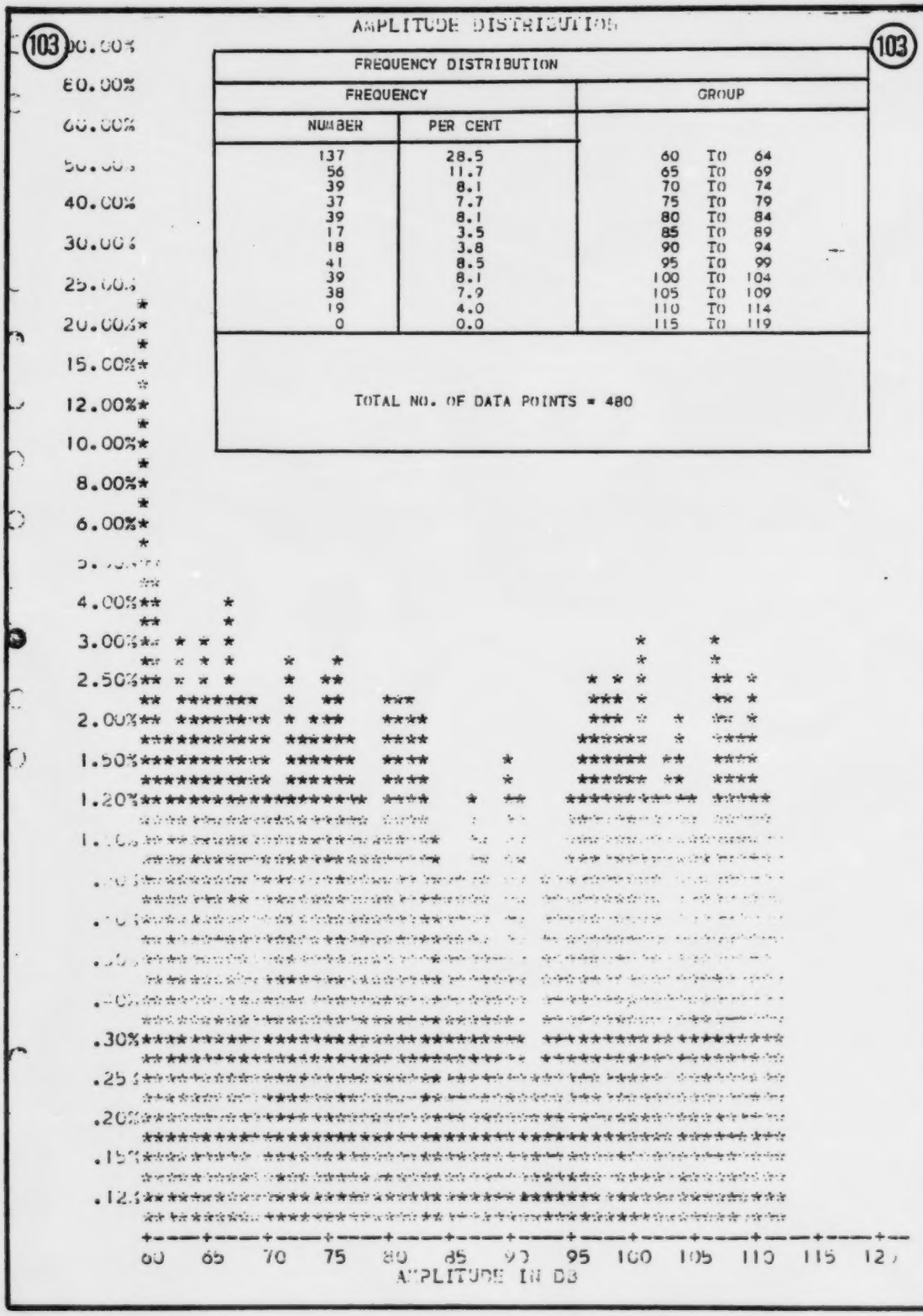
[illegible]

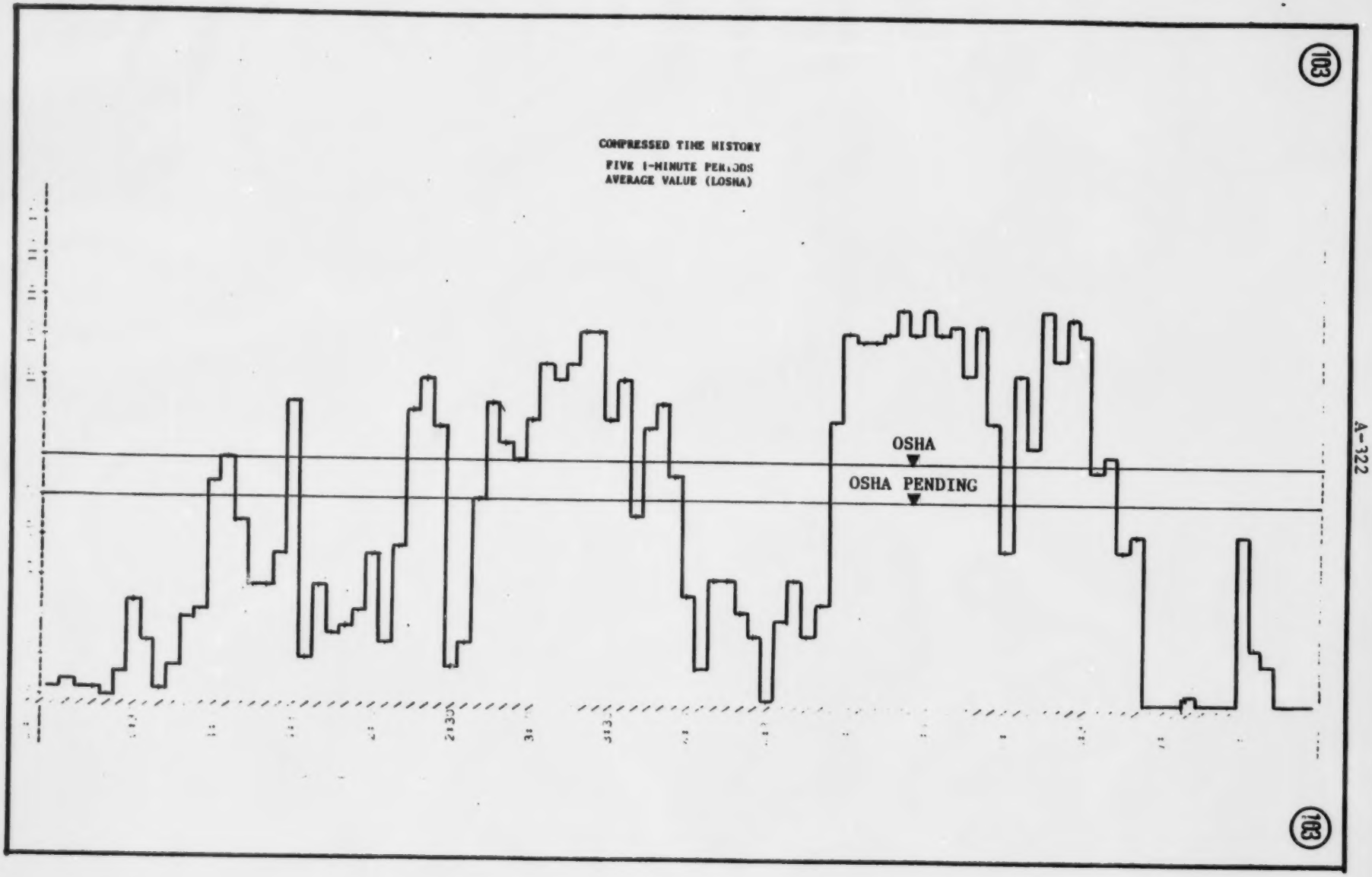
AMPLITUDE DISTRIBUTION

(103) (103)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
137	28.5	60 TO 64
56	11.7	65 TO 69
39	8.1	70 TO 74
37	7.7	75 TO 79
39	8.1	80 TO 84
17	3.5	85 TO 89
18	3.8	90 TO 94
41	8.5	95 TO 99
39	8.1	100 TO 104
38	7.9	105 TO 109
19	4.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




103
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
103

(104)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226   60   64    4    1
      48      115200  480
 73  77  60  72  72  73  72  66  76  75  77  68  76  80  72  72
 76  78  83  82  82  80  74  74  74  77  75  76  71  68  72  83
 97 100 100 100 100 100 101 101 101  92  97  97  90  68  60  60
 60  60  60  65  62  74  60  60  67  68  61  63  60  65  61  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  61  62  60  60  60  63  73  60  60
 61  72  93  96  67  61  69  92  84  77  69  91  78  74  81  83
 82  81  82  82  83  83  82  81  73  75  84  90  93 106 108 104
 91  90  90  90  90  82  82  84  80  83  91  80  81  81  86  87
100  81  84  89  80  80  79  84  80  79  80  79  79  79  79  80
 78  84  62  60  75  81  81  86  94  91  89  83  84  84  84  83
 65  66  64  72 103 108  96  87  85  86  89  91  91  91  89  87
103 104  94  99 100 100 106  99  99  98  84  87  96  92  95  97
108 108  89 101 111  95  97  85  60  84  76  63  60  60  61  60
 63  77  78  93  84 105 105 104  97  90  89  90  90  99  88  90
 90  60  75  70  83  91  92 103 103  97  94  83  75  67  69  60
 60  60  60  60  60  60  60  60  63  60  60  69  60  60  60  60
 60  60  62  60  68  68  60  60  61  60  63  60  60  60  67  68
 64  60  61  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  67  66  74  65  60  60  61  62  60  61  61  60  60  60  62
 63  60  60  60  60  60  60  60  60  60  93  94  80  83  89  76
 81  87  89  87  78  94  87  69  84  86  74 106 102 100  91 104
 94  72  60  90  90  72  66  73  65  78  60  60  60  60  70  60
 62  60  61  62  65  61  61  65  77  60  60  60  60  60  60  60
 60  60  60  60  69  64  60  60  60  60  62  60  60  60  60  60
 60  62  67  64  67  60  62  60  62  60  60  60  61  66  60  68
 60  62  67  65  68  60  60  60  60  60  63  67  70  62  60  60
 60  60  61  60  64  60  60  60  60  66  68  61  60  62  64  69
 71  65  67  66  75  61  65  67  63  66  69  72  71  70  68  74
 65  61  67  76  68  74  82  97  96  95  95  97  99  97  95  95
%EOF



ENTER LOG DATE (DD/MM/YR) : 18/07/79
ENTER SITE CODE (5 CHARS) : CC202
ENTER USER CODE (4 CHARS) : 9612
 ENTER JOB CODE (3 CHARS) : SHI


   DATA LOGGED :18 JULY 1979          DATA ANALYZED : 14 SEPT 1979
       LOGGER : 08-301/26                 SITE CODE : CC201
SERIAL NUMBER : 1226                       JOB CODE : SHI
     BASELINE : 60 DB                     USER CODE : 9612
DYNAMIC RANGE : 54 DB                    THRESHOLD : 60 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:12

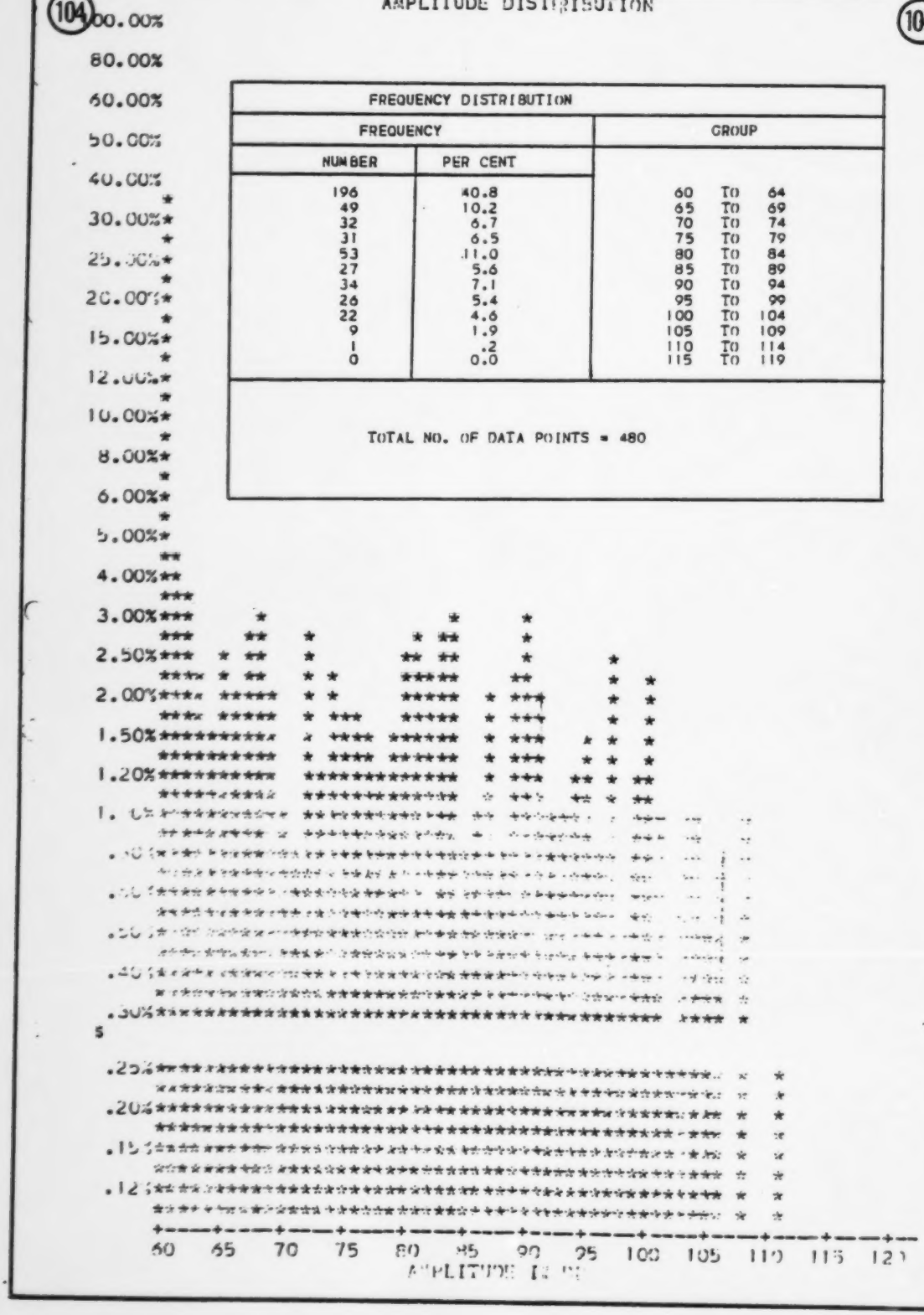
          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
ICOR DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOGRA                    DOSE
HOUR     CURRENT  CUMULATIVE      CURRENT  CUMULATIVE
   1        88.6        88.6       10.234       10.23
   2        78.9        85.2        2.687       12.92
   3        69.7        87.1       12.012       24.93
   4        97.7        91.5       36.250       61.18
   5        82.8        90.4        4.595       65.78
   6        87.5        90.0        8.838       74.62
   7        63.9        89.9         .334       74.95
   8        83.4        89.4        4.995       79.95
MIN. COMP. =  60 DB              MAX. COMP. = 111 DB
ARITHMETIC MEAN =  72 DB
STD. DEVIATION =  14 DB
VARIANCE =195 DB
```

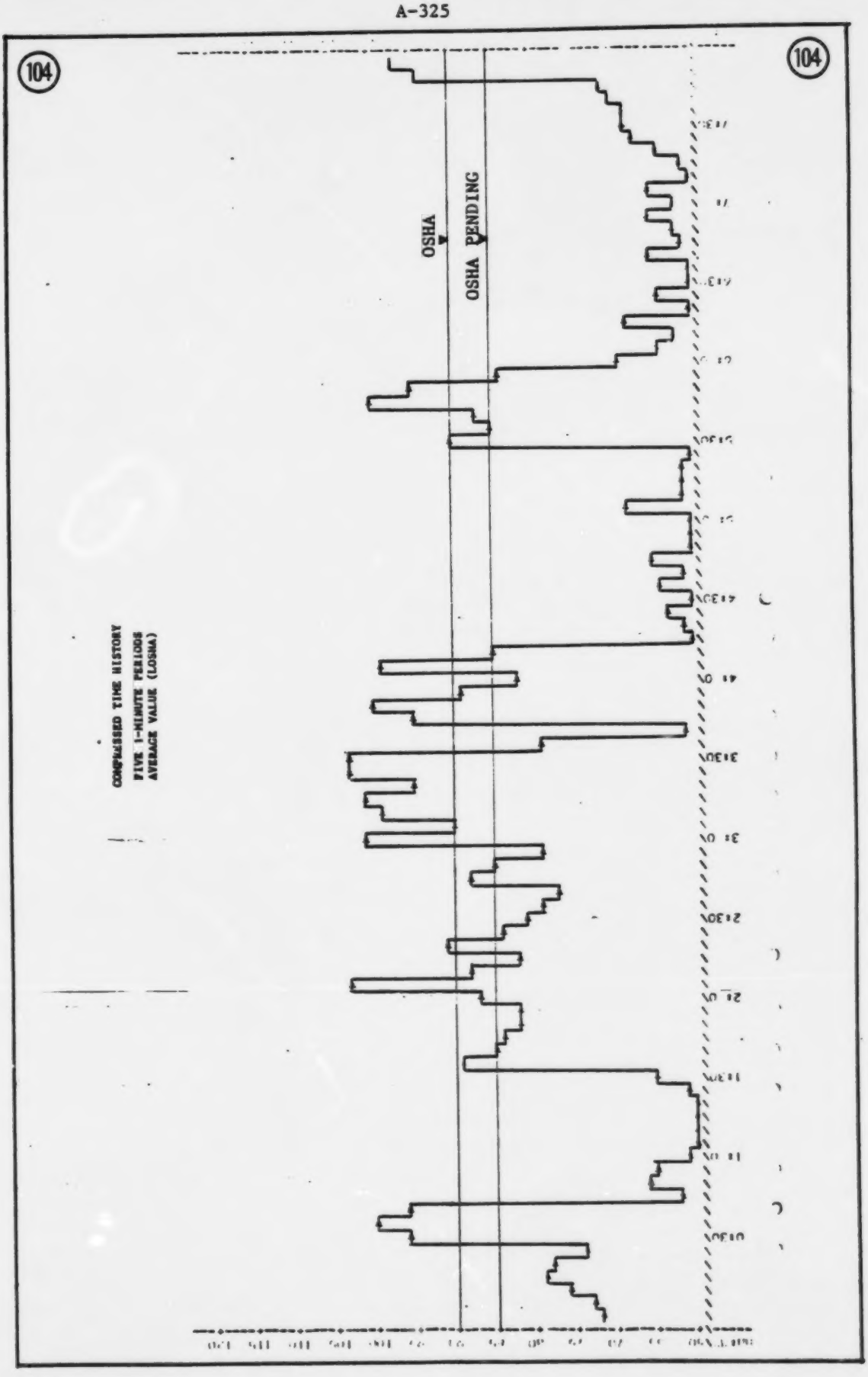
(104)

(104) AMPLITUDE DISTRIBUTION (104)



FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
196	40.8	60 TO 64
49	10.2	65 TO 69
32	6.7	70 TO 74
31	6.5	75 TO 79
53	11.0	80 TO 84
27	5.6	85 TO 89
34	7.1	90 TO 94
26	5.4	95 TO 99
22	4.6	100 TO 104
9	1.9	105 TO 109
1	.2	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


104
104
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(105)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1226   60   64    4    1
      68      115200  480
  62  60  60  60  65  69  70  72  72  76  70  69  73  75  74  62
  65  64  75  76  70  71  65  67  73  70  72  73  72  73  72  62
  69  75  67  77  85  90  88  91  98  98  98  98  97  96  97  98
  89  82  82  78  76  71  80  80  87  80  86  84  88  73  69  76
  76  72  72  70  67  65  72  70  74  74  69  68  82  82  71  71
  76  74  60  68  62  60  60  60  60  60  60  60  70  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  76  74  70  82  94
 100  94  89  95  95  94  90  90  90  92  89  90  90  90  92  93
  97  93  93  96  92  94  96  92  94  97  97  92  94  97  97  92
  79  73  79  84  84  88  91  85  90  98  99 105 105 104  92  81
  82  87  95  90  95 102  97  90 105  97  93  96  93  89  88  89
  90  87  91  87  83  88  90  97  94  94  94  94  94  93  96  94
  96  98  93  92  90  90  91  89  84  75  60  60  60  60  60  60
  60  60  60  61  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  61  77  62  60  60
  60  60  64  70  64  83  86  84  97  97  87  86  85  84  81  63
  86  87  66  86  83  88  74  60  60  60  61  60  62  64  65  60
  63  61  74  75  71  60  64  64  67  67  80  89  88  87  90  93
  93  94  90  84  87  85  90  94  94  95  94  94  92  94  93  93
  97  97  96 102  89  84  93  93  94 104 113 100  94  94  91  88
  62  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  67  63  60  60  61  62  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  67  68  63  60  60  63  61  73  74  68
  86  88  86  78  85  60  66  60  63  60  62  60  60  62  60  62
  60  60  60  62  61  66  64  63  63  60  62  64  64  66  66  60
*EOF
```

(105)

```
ENTER LOG DATE (DD/MM/YR) : 20/07/79
ENTER SITE CODE (5 CHARS) : CC203
ENTER USER CODE (4 CHARS) : 9608
 ENTER JOB CODE (3 CHARS) : SHB
```

```
   DATA LOGGED :20 JULY 1979          DATA ANALYZED : 17 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : CC203
 SERIAL NUMBER : 1226                       JOB CODE : SHB
      BASELINE : 60 DB                    USER CODE : 9608
 DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:17
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES
```

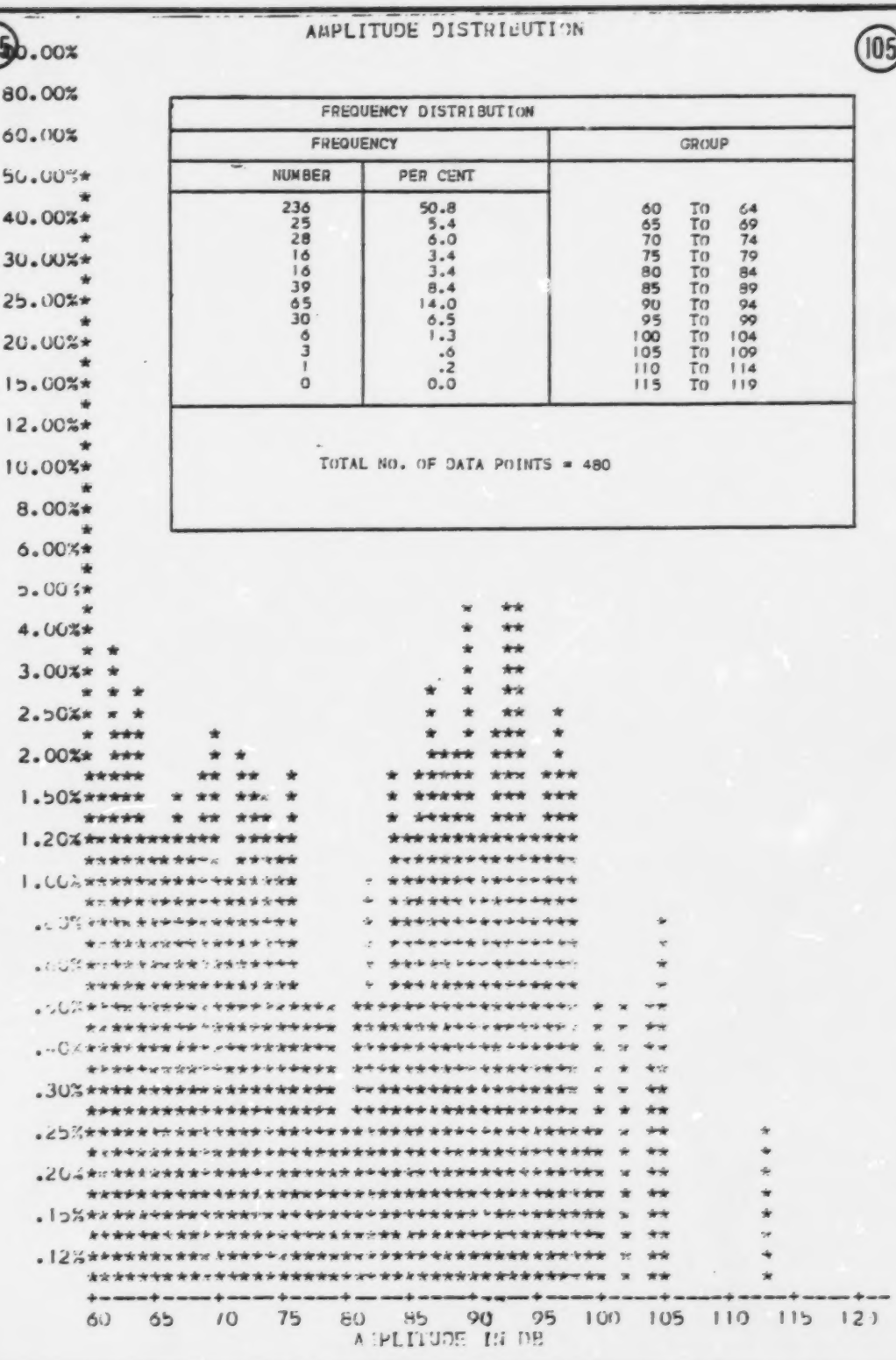
TIME	LOGIA		NOISE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	85.2	85.2	6.394	6.39
2	81.5	83.6	3.854	10.25
3	94.0	88.9	21.815	32.06
4	85.6	88.2	6.809	38.87
5	86.0	87.8	7.181	46.05
6	90.6	88.4	13.656	59.71
7	80.3	87.3	.204	59.91
8	70.3	86.4	.813	60.73

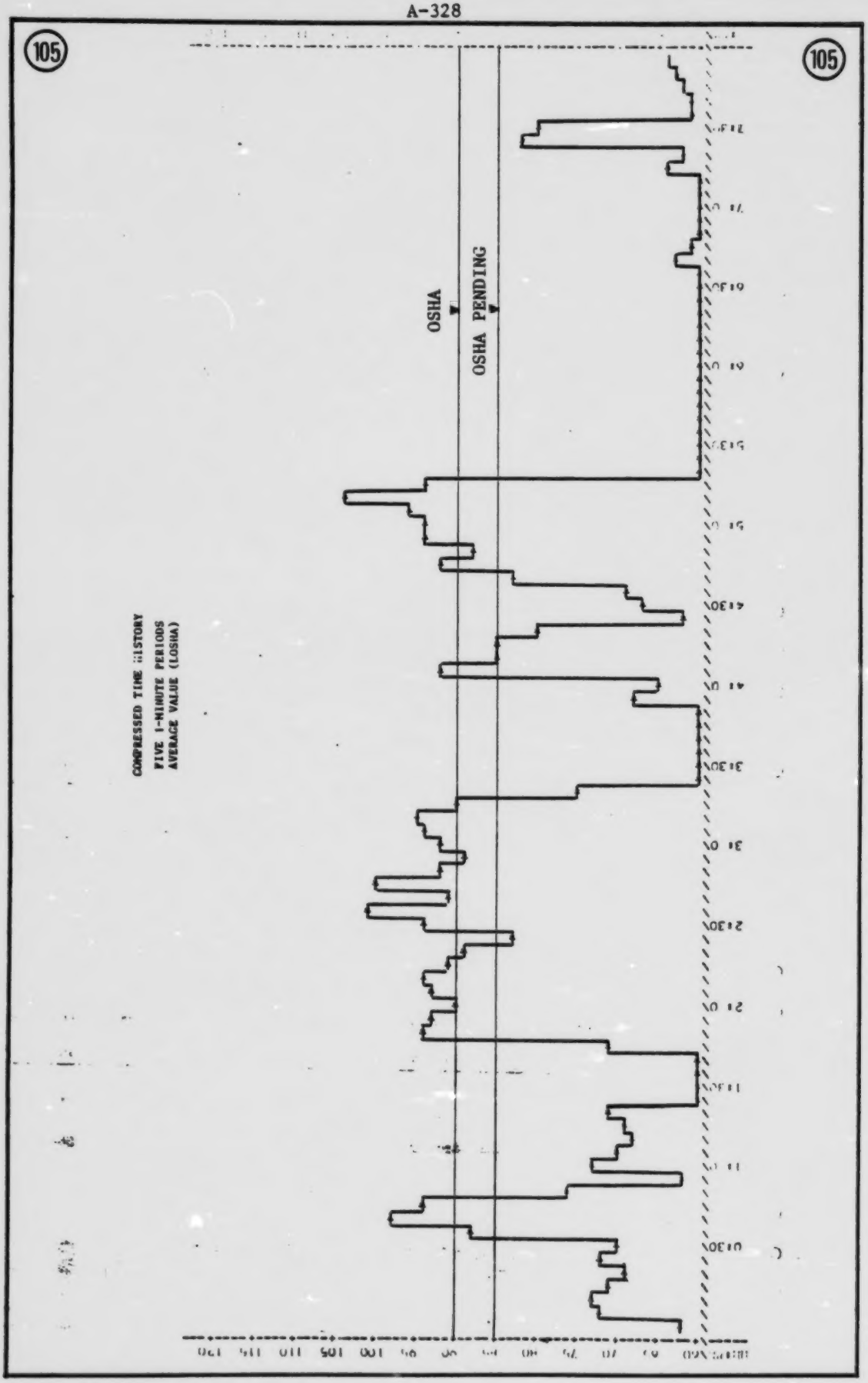
```
MIN. COMP. =  60 DB                MAX. COMP. = 113 DB
ARITHMETIC MEAN =  72 DB
STD. DEVIATION =  14 DB
VARIANCE =194 DB
```

(105) AMPLITUDE DISTRIBUTION (105)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
236	50.8	60 TO 64
25	5.4	65 TO 69
28	6.0	70 TO 74
16	3.4	75 TO 79
16	3.4	80 TO 84
39	8.4	85 TO 89
65	14.0	90 TO 94
30	6.5	95 TO 99
6	1.3	100 TO 104
3	.6	105 TO 109
1	.2	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




105
105
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(106)

PLACE TAPE IN DEVICE UNIT, TYPE 1 <SPACE> AND A <RETURN>
1 20 80 121 60 64 4 1
18569 115200 400
65 70 67 70 74 78 73 67 74 64 68 65 75 64 65 74
76 74 71 68 70 71 64 75 61 72 74 79 82 72 66 65
68 72 75 62 75 64 72 76 87 96 95 96 93 81 81 82
95 93 93 93 93 94 91 89 95 94 97 82 87 92 79 64
70 74 87 93 97 91 95 95 95 94 89 94 94 89 96 88
83 79 83 86 82 86 93 92 93 95 95 94 93 91 93 92
95 97 93 95 90 90 92 91 92 91 91 89 90 83 87 87
88 93 94 93 93 84 84 85 95 87 85 89 92 78 82 83
86 91 90 84 82 78 94 91 93 93 94 95 106 89 76 81
90 93 90 93 90 89 92 92 92 92 88 89 88 93 94 91
95 92 92 96 93 89 89 88 91 90 93 86 97 92 92 93
86 87 74 80 82 91 86 90 92 91 88 85 92 95 95 95
95 89 93 93 95 93 93 94 94 92 95 93 93 92 91 97
95 89 89 96 95 94 90 94 94 97 93 93 90 90 93 93
93 90 73 85 80 85 88 95 95 87 89 80 87 70 71 72
60 60 60 60 60 60 62 66 63 60 60 60 65 64 68 62
66 71 60 61 60 79 67 65 66 61 65 70 80 79 67 70
72 75 83 79 82 85 92 93 93 93 97 96 95 95 93 95
93 94 85 80 81 77 74 75 79 83 80 94 93 94 81 63
80 81 77 83 90 94 93 93 93 94 95 92 92 72 80 91
88 74 73 83 80 79 77 93 90 75 87 90 93 94 98 93
93 94 92 92 88 84 71 74 74 63 60 67 70 66 65 63
61 65 70 62 69 64 64 66 69 61 71 76 73 72 73 75
70 78 79 86 83 78 82 83 87 82 80 75 77 66 75 76
67 60 62 65 69 74 63 63 76 77 73 71 72 70 69 69
71 64 65 65 63 66 69 72 72 76 70 78 76 67 79 80
77 76 65 71 80 80 77 76 74 74 78 77 76 72 77 70
74 68 72 75 72 71 82 70 66 66 68 70 71 64 67 68
72 76 68 63 72 70 70 74 70 63 60 61 62 78 74 79
82 72 71 66 69 76 79 75 76 70 74 82 86 72 95 93
<EOF

(106)

ENTER LOG DATE (DD/MM/YR) : 11/07/79
ENTER SITE CODE (5 CHARS) : 00205
ENTER USER CODE (4 CHARS) : 9575
ENTER JOB CODE (3 CHARS) : SHI

C

DATA LOGGED : 11 JULY 1979
LOGGER : 08-301/26
SERIAL NUMBER : 1218
BASELINE : 80 DB
DYNAMIC RANGE : 64 DB
SAMPLING RATE : 4/SEC
TEST DURATION = 8: 0: 0

DATA ANALYZED : 12 SEPT 1979
SITE CODE : 00205
JOB CODE : SHB
USER CODE : 9575
THRESHOLD : 80 DB
TOTAL SAMPLES = 115200
STANDBY TIME = 131/132

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

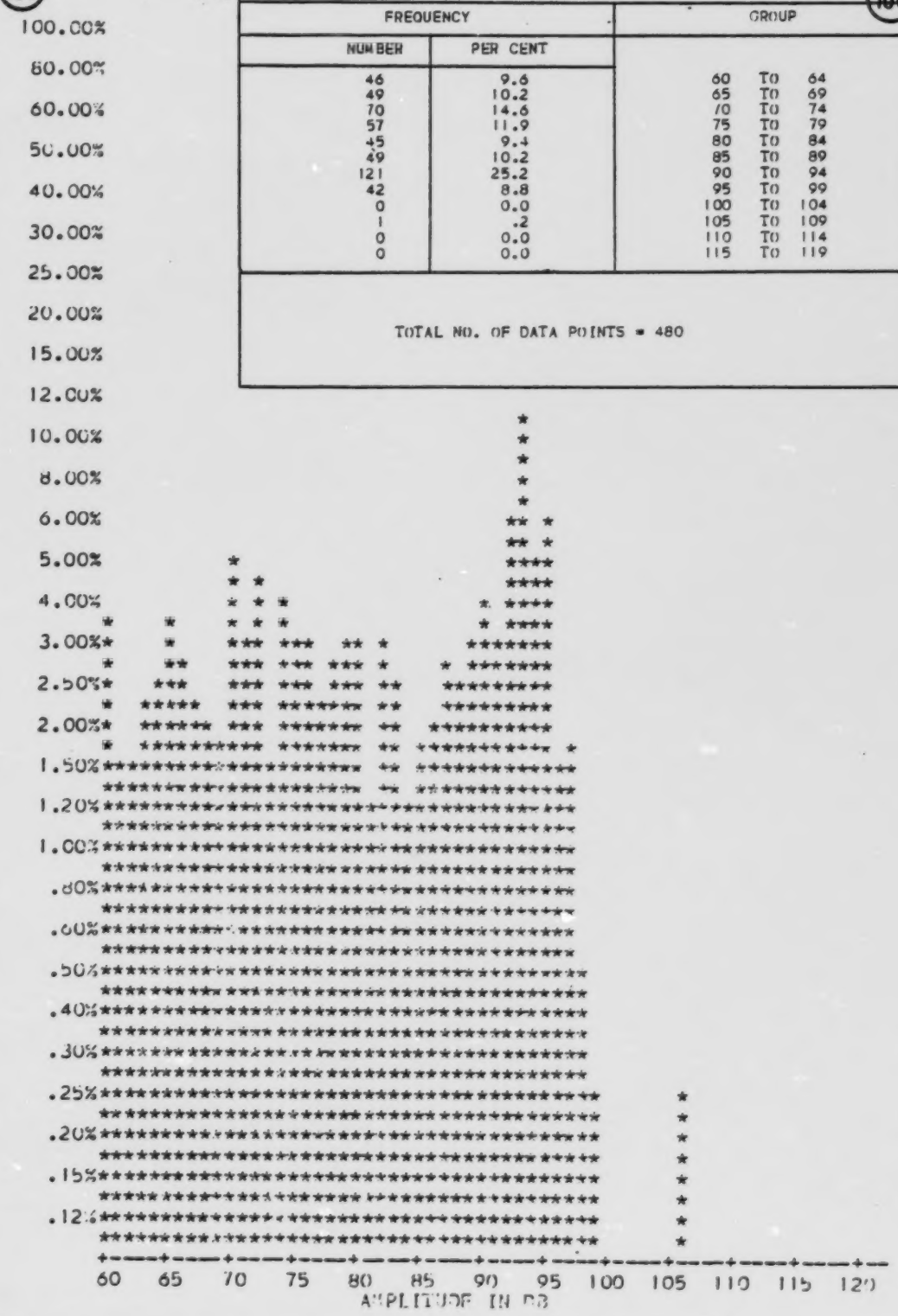
TIME	LOGIA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	89.5	89.5	6.700	6.70
2	91.4	89.0	15.134	21.83
3	91.0	89.8	14.444	36.28
4	91.7	90.3	15.817	52.10
5	84.7	89.5	5.989	58.09
6	87.4	89.2	8.701	66.79
7	79.0	88.2	1.751	68.54
8	76.1	87.5	2.412	70.95

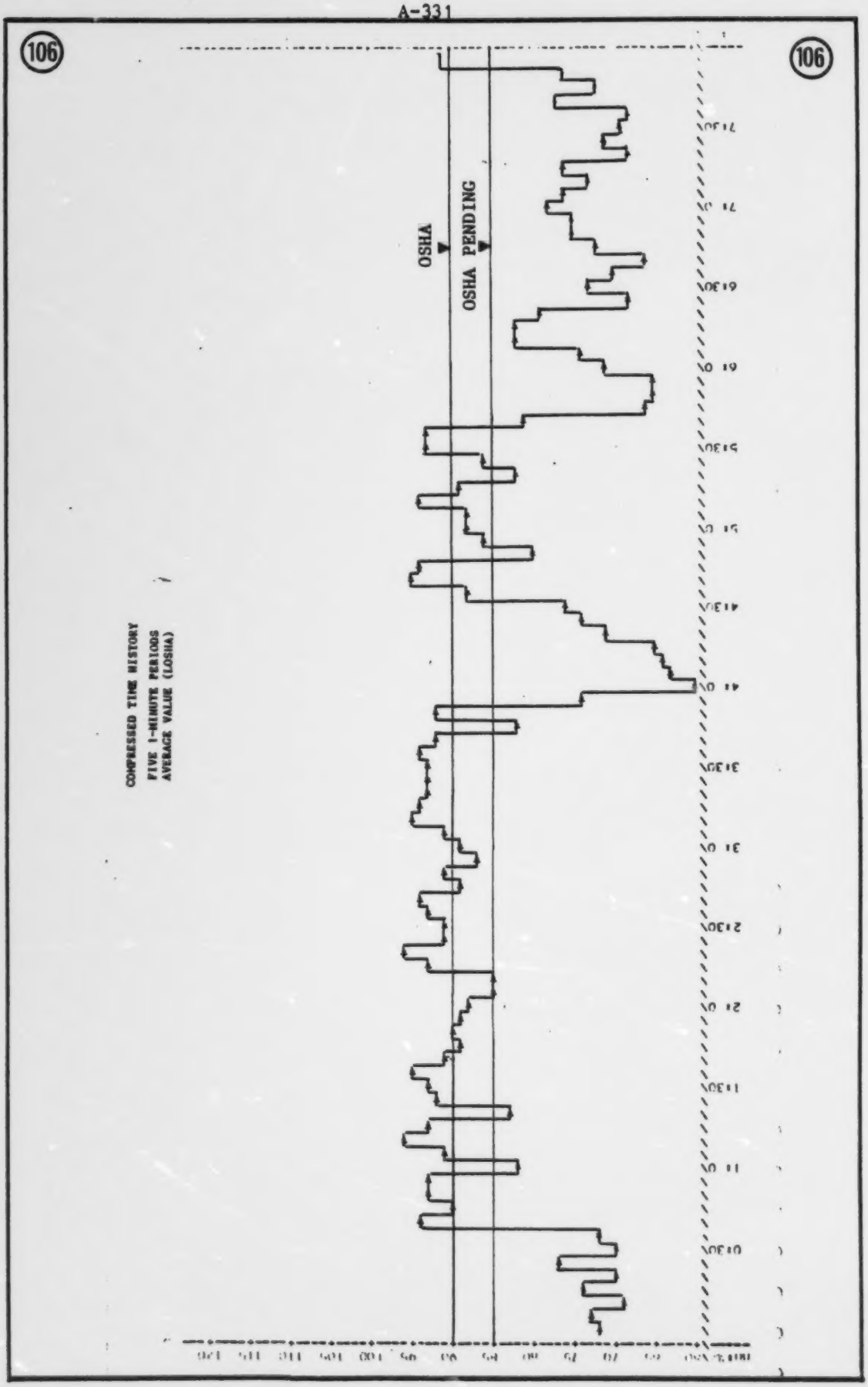
MIN. COMP. = 60 DB
ARITHMETIC MEAN = 90 DB
STD. DEVIATION = 11 DB
<ANALOG =121 DB
MAX. COMP. = 109 DB

(106)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
46	9.6	60 TO 64
49	10.2	65 TO 69
70	14.6	70 TO 74
57	11.9	75 TO 79
45	9.4	80 TO 84
49	10.2	85 TO 89
121	25.2	90 TO 94
42	8.8	95 TO 99
0	0.0	100 TO 104
1	.2	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		

(106)




106
106
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(107)

```
PLAY TAPE [illegible]
  1  26  60  [illegible]  64   4   1
     13      [illegible]
 79  72  60  60  60  60  61  60  60  60  60  60  60  60  61
 64  60  62  61  61  63  62  62  61  60  61  60  60  60  60  65
 63  60  63  69  61  [illegible]  76  [illegible]  72  72  84  [illegible]  86  91  92
 92  79  [illegible]  65  61  61  [illegible]  95  67  70  74  83  [illegible]  83  [illegible]  96
 98  96  99 102 101  98  [illegible] 100 101  98  99  96  [illegible]  77  61  67
 66  69  [illegible]  66  62  [illegible]  [illegible]  73  73  [illegible]  63  60  71  62  76
 75  69  73  75  79  65  [illegible]  [illegible]  72  73  63  [illegible]  [illegible]  77  65  79
 71  60  [illegible]  62  71  61  61  [illegible]  61  [illegible]  61  69  [illegible]  [illegible]  61  61
 63  63  69  74  63  62  69  76  76  65  78  67  72  68  76  [illegible]
 77  65  70  70  72  [illegible]  67  65  [illegible]  63  70  65  69  71  94  96
 87  94  [illegible]  93  [illegible]  [illegible]  [illegible]  [illegible]  85  84  [illegible]  [illegible]  [illegible]  89 101
104  93  86  81  85  87  87  83  [illegible]  96 102  95  96  96  89  88
 89  85  86  86  90  84  [illegible]  89  87  87  97  95 100 101 102 104
 [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  97  96 112 116 113  [illegible]  [illegible]  [illegible]
 87 100 111  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 77  80  91  95  89  [illegible]  92  93  92  [illegible]  [illegible]  [illegible]  [illegible]  71  70  64
 73  67  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  71  70  63  [illegible]  [illegible]  63  [illegible]  74
 75  72  67  [illegible]  [illegible]  62  [illegible]  63  [illegible]  62  [illegible]  [illegible]  [illegible]  90  95  90
 71  71  [illegible]  [illegible]  [illegible]  71  [illegible]  [illegible]  74  [illegible]  [illegible]  73  [illegible]  70  [illegible]  70
 [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  71  75  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  71  73
 77  81  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  72  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  73  [illegible]
 [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  72  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 94  92  [illegible]  92  [illegible]  [illegible]  [illegible]  90  [illegible]  [illegible]  92  [illegible] 112  92  [illegible] 114
106 102  94  89  [illegible]  [illegible]  [illegible]  [illegible]  97  90  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 71  70  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
 73  82  72  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
ZEOF
```

(107)

```
ENTER LOG DATE (DD/M*/YR) : 12/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 9636

 ENTER JOB CODE (3 CHARS) : SnB0
```

```
   DATA LOGGED :12 JULY 1979          DATA ANALYZED : 12 SEPT 1979
        LOGGER : SD-301/24                 SITE CODE : CC210
 SERIAL NUMBER : 1220                       JOB CODE : SnB
      BASELINE : 60 DB                     USER CODE : 9636
DYNAMIC RANGE : 24 DB                      THRESHOLD :  80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =  [illegible]: 0: 0      STANDBY TIME =   0: 0: 3
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE LEVEL (N.E.L.) CALCULATIONS
ARE BASED ON THE FOLLOWING
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CALIBRATED) LEVEL = 80 DB
  NUMBER OF SAMPLINGS = 480
PERIOD =  1 MINUTES
```

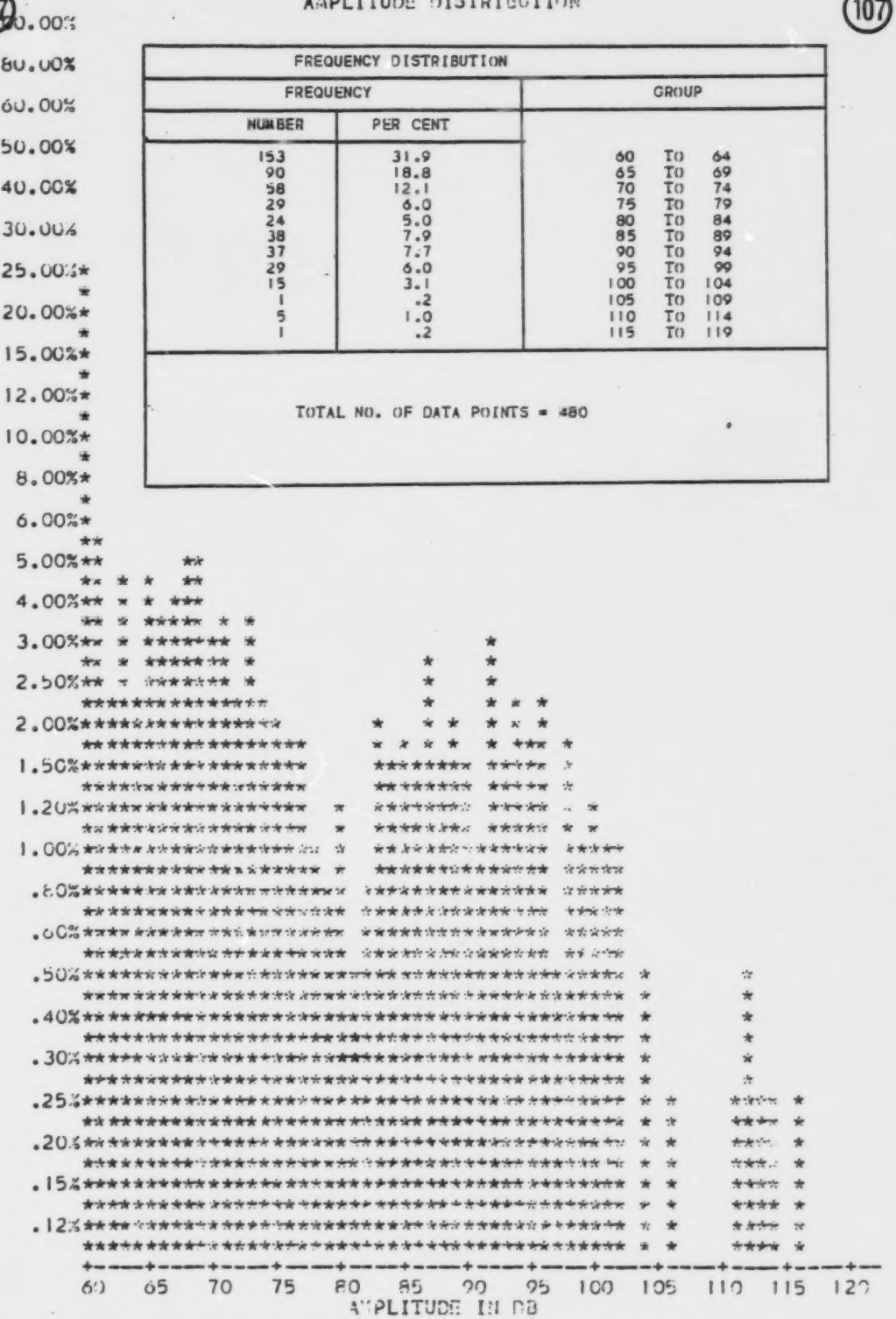
TIME	LEVEL		ENERGY	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	80.5	80.5	3.340	3.34
2	88.6	85.7	10.345	13.69
3	85.0	86.4	6.210	19.90
4	97.9	91.0	37.378	57.27
5	81.5	89.8	3.474	61.15
6	70.6	88.6	.847	162.00
7	92.6	89.4	17.986	79.98
8	83.6	88.8	6.125	85.11

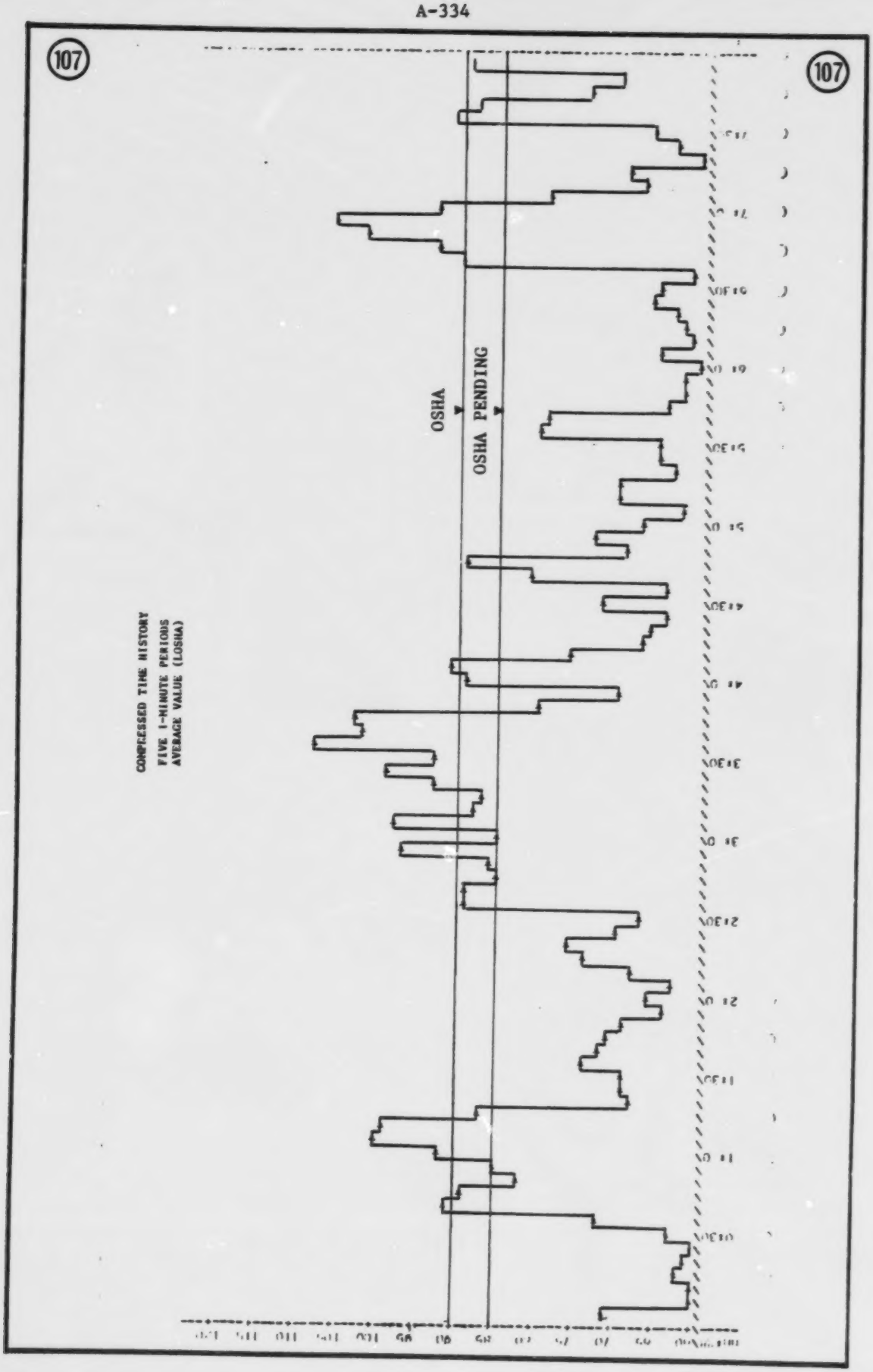
```
MIN. CURR. = 60 DB                 MAX. CURR. = 116 DB
ARITH. MEAN = 74 DB
STD. DEVIATION = 14
VALID = 125
```

(107) AMPLITUDE DISTRIBUTION (107)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
153	31.9	60 TO 64
90	18.8	65 TO 69
58	12.1	70 TO 74
29	6.0	75 TO 79
24	5.0	80 TO 84
38	7.9	85 TO 89
37	7.7	90 TO 94
29	6.0	95 TO 99
15	3.1	100 TO 104
1	.2	105 TO 109
5	1.0	110 TO 114
1	.2	115 TO 119

TOTAL NO. OF DATA POINTS = 480




107
107
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)

(108)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1217    60    64     4     1
    4765      115200   480
  62  60  60  60  61  60  60  60  63  64  60  60  61  60  60  60
  60  60  63  60  63  61  61  61  69  61  62  64  61  60  65  61
  68  68  62  67  75  70  84  77  91  99 103 101 102 100 104 102
  99  97  86  81  80  84  80  80  88  80  90  80  80  80  80  82
  80  80  80  85  80  80  80  80  80  87  88  81  82  80  81  80
  80  82  80  80  80  80  80  80  80  80  80  81  80  80  80  80
  80  80  81  81  80  71  71  80  80  72  70  70  79  84  95  91
  90  92  95  96  96  95  95  95  96  96 100  96  89  99  94  97
  97  97  97  90  92  93  88  97 100 104 101 102 108 109  83  85
  85  93 100 105  99  98  96  93  89  86  92  92  89  93  85  77
  86  86  89  91  79  74  88  81  85  89  95  78  82  85  82  84
  84  85  86  90  88  93  86  80  80  80  80  73  91  85  93  83
  85  86  85  84  81  86  88  81  80  85  86  88  86  86  84  83
  92  93  88  85  86  91  89  94  96  76  90  88  92  87  80  80
  88  80  80  80  82  80  80  80  80  80  80  81  83  86  80  80
  80  80  81  80  80  80  80  81  80  80  80  82  87  83  80  73
  64  64  81  80  80  81  81  80  85  80  80  80  80  80  80  80
  83  80  80  80  84  80  81  80  80  83  80  88  81  80  80  80
  80  80  81  84  84  80  80  86  80  80  80  80  80  81  80  83
  83  80  80  80  80  80  80  80  80  85  84  80  79 104 104  91  89
  93  88  85  85  86  82  87  75  87  84  80  86  80  80  90  93
  92  93  93  94  96  76  73  70  88  96  95  80  91  83  80  76
  90  93  99 102  95  75  82  80  84  84  90  84  81  76  77  83
  89  89  89  75  90  93  84  89  85  80  80  80  85  80  80  80
  80  80  83  82  75  72  80  80  84  87  80  82  80  80  88  86
  84  80  80  80  88  86  89  76  73  82  81  85  73  82  77  75
  75  72  84  84  73  74  88  88  85  81  87  80  80  80  80  85
  81  85  82  80  87  91 103 102 100  98 102 101  97  78  80  74
  84  80  80  87  76  78  81  76  80  84  82  82  83  80  80  80
  80  80  80  80  81  80  80  80  80  80  80  80  80  80  81  80
$EOF


ENTER LOG DATE (DD/MM/YR) : 16/07/79
ENTER SITE CODE (5 CHARS) : CC210
ENTER USER CODE (4 CHARS) : 9630

 ENTER JOB CODE (3 CHARS) : SHBO
```

C

```
    DATA LOGGED :16 JULY 1979          DATA ANALYZED : 13 SEPT 1979
        LOGGER : 08-301/26                 SITE CODE : CC210
 SERIAL NUMBER : 1217                      JOB CODE  : SHB
      BASELINE : 60 DB                     USER CODE : 9630
 DYNAMIC RANGE : 84 DB                     THRESHOLD : 80 DB
 SAMPLING RATE : 4/SEC                TOTAL SAMPLES = 115200
 TEST DURATION = 8 HRS 0 MIN          STANDBY TIME = 0 HRS 0 MIN
```

TIME HISTORY ANALYSIS

```
NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING
TOTAL TIME = 480 MINUTES
EXCHANGE (DOUBLE) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES
```

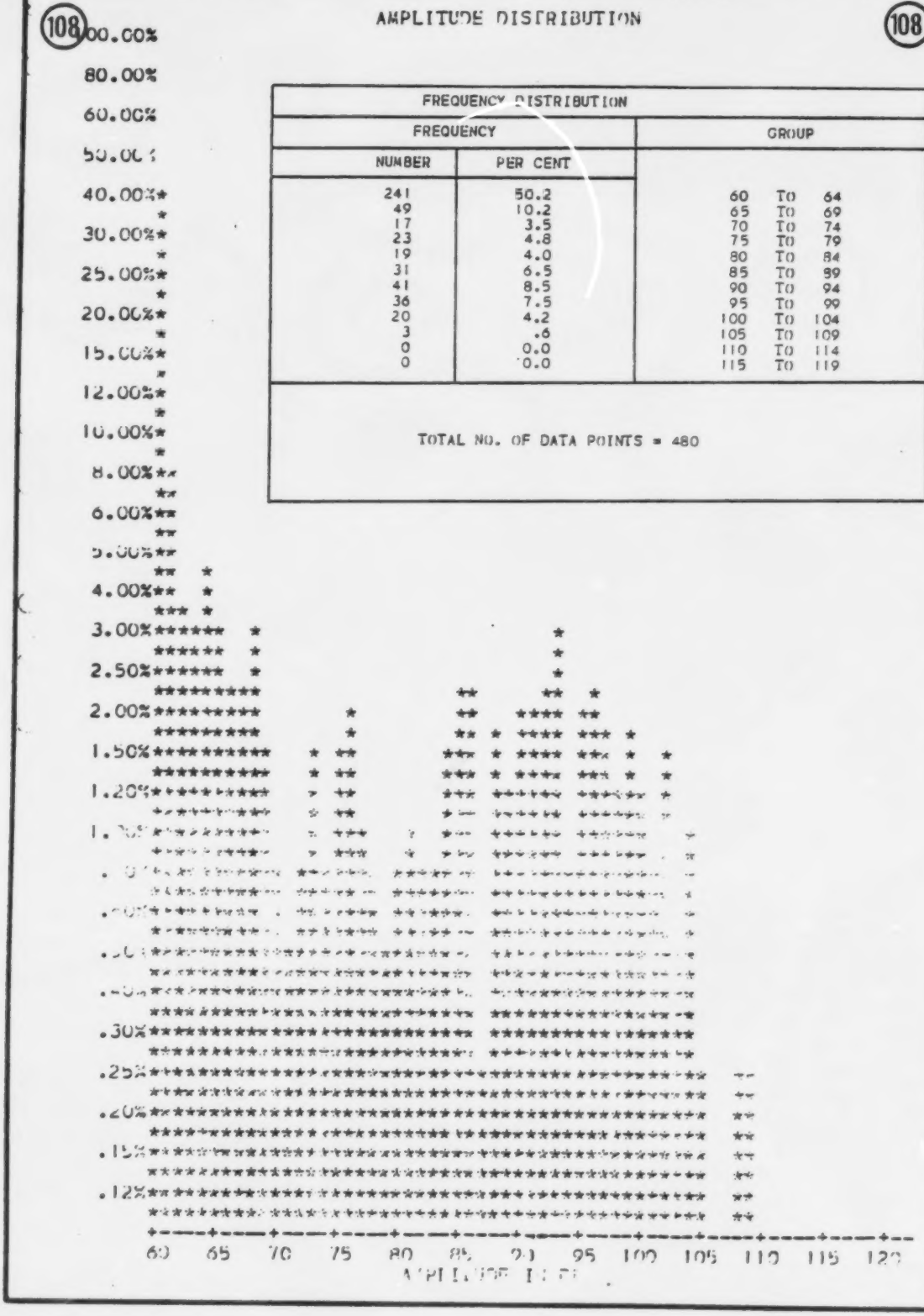
TIME	LOCAL		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	88.0	88.0	9.473	9.47
2	92.7	90.8	4.541	14.01
3	96.0	91.0	28.797	42.81
4	94.1	89.8	5.525	48.34
5	61.9	88.2	.253	48.59
6	84.7	88.3	10.507	59.10
7	75.6	87.4	1.491	60.59
8	86.0	87.2	7.131	67.93

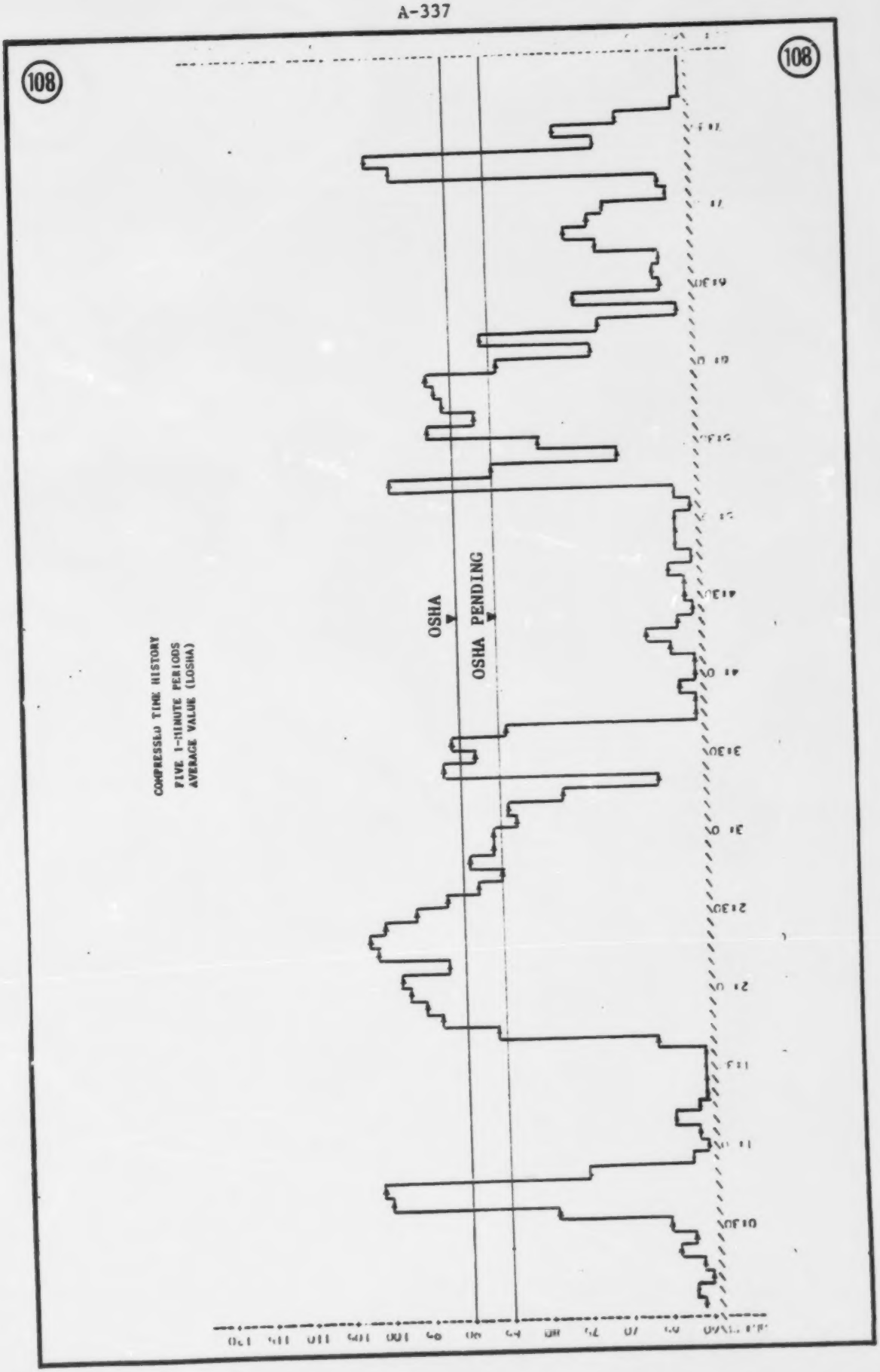
```
MIN. COMP. = 60 DB                 MAX. COMP. = 109 DB
ARITHMETIC MEAN = 72 DB
STD. DEVIATION = 15 DB
VARIANCE =223 DB
```

(108) AMPLITUDE DISTRIBUTION (108)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
241	50.2	60 To 64
49	10.2	65 To 69
17	3.5	70 To 74
23	4.8	75 To 79
19	4.0	80 To 84
31	6.5	85 To 89
41	8.5	90 To 94
36	7.5	95 To 99
20	4.2	100 To 104
3	.6	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




108
108
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(109)

PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"

(109)

1 26 80 1212 60 64 4 1
22902 114833 478

63	67	67	60	60	62	60	60	60	61	60	61	60	60	60	62
67	75	72	60	76	61	76	70	73	67	78	82	79	76	67	71
73	76	63	71	69	60	72	67	71	66	62	69	70	72	73	70
74	67	68	73	71	73	77	75	74	68	68	75	69	69	71	64
64	60	67	66	63	61	73	65	70	62	61	60	73	80	72	60
60	63	63	80	66	67	92	86	92	89	93	92	73	84	64	71
71	66	63	60	60	62	60	74	64	70	98	89	69	76	72	72
67	79	80	78	95	98	100	97	99	98	97	92	82	62	61	76
61	60	60	60	61	60	60	60	60	60	80	87	76	67	77	90
80	94	93	87	81	93	84	80	71	67	63	89	81	71	66	61
60	62	61	81	81	81	72	90	92	68	60	60	60	60	75	63
79	67	60	60	65	60	60	60	60	60	60	60	60	60	60	60
60	60	60	60	60	60	60	64	63	60	60	60	60	64	90	95
95	95	90	82	75	81	74	62	64	74	78	73	75	69	60	71
64	66	88	94	94	94	95	95	95	94	94	97	95	93	93	94
95	93	96	92	88	69	81	64	74	70	64	60	68	75	73	66
69	73	87	73	67	81	84	81	78	72	66	74	66	60	63	60
60	60	65	66	60	71	73	66	61	67	60	61	62	63	64	60
62	69	63	71	62	68	63	73	77	66	76	66	60	60	60	64
60	62	64	70	68	60	76	78	70	71	76	82	87	88	90	90
60	60	60	60	60	60	60	60	60	60	60	91	80	71	91	82
63	68	68	71	71	63	66	72	61	68	88	90	87	90	93	92
91	93	95	94	76	89	87	88	93	69	60	60	60	60	60	60
60	60	61	60	60	83	83	60	60	60	60	65	60	60	60	77
60	60	60	82	75	60	60	86	92	90	94	90	87	80	66	79
69	63	62	76	72	78	77	69	70	73	77	76	65	67	71	72
66	69	60	62	71	68	68	72	66	69	82	65	68	60	60	60
61	60	65	60	60	60	60	60	60	60	70	79	84	82	66	70
61	60	74	79	60	61	64	63	60	60	60	67	67	60	60	60
60	60	60	60	62	60	60	60	60	60	60	60	65	64	60	60

"EOF"

ENTER LOG DATE (DD/MM/YR) : 13/09/79
ENTER SITE CODE (5 CHARS) : 00307
ENTER USER CODE (4 CHARS) : 9508

ENTER JOB CODE (3 CHARS) : SHB

DATA LOGGED :13 SEPT 1979
LOGGER : 08-301/26
SERIAL [illegible] : 1212
[illegible] : [illegible]
[illegible] : [illegible]
SAMPLING RATE : 4/SEC
TEST [illegible] = 78% 32-

DATA ANALYZED : 27 SEPT 1979
SITE CODE : 00307
JOB CODE : SHB
USER CODE : 9508
[illegible] : 80
TOTAL DATA PTS = [illegible]
S/R/M/F II = [illegible]

[illegible] HISTORY ANALYSIS

[illegible] INCR (...I.) CALCULATION
[illegible]
[illegible] = [illegible]
[illegible]
[illegible]
NUMBER OF COMPUTATIONS = 478
PERIOD = 1 MINUTES

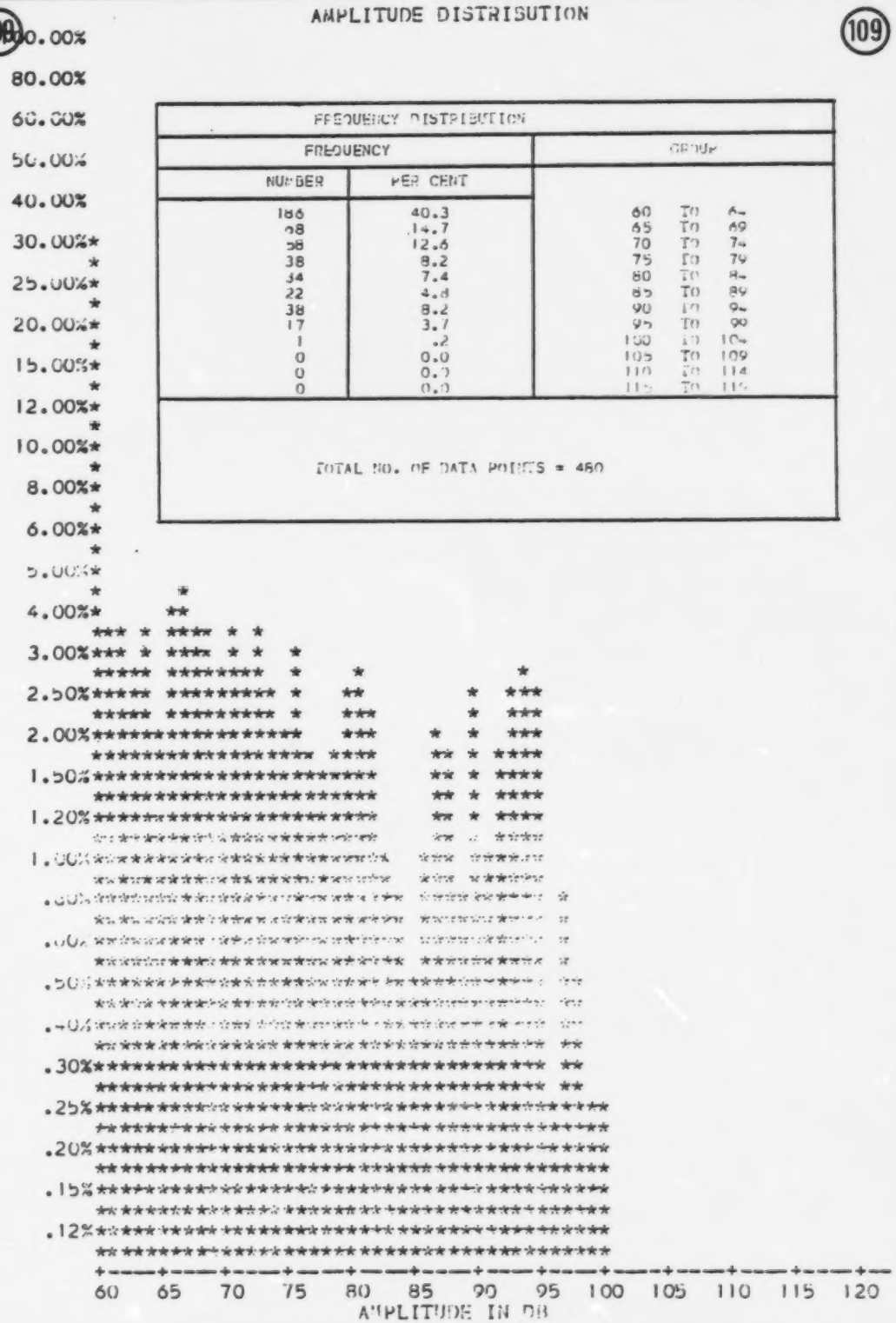
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	71.2	71.2	.717	.92
2	84.9	80.9	6.134	7.04
3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]
6	83.2	82.8	4.[illegible]	27.74
7	79.2	[illegible]	2.[illegible]	[illegible]
8	[illegible]	[illegible]	.[illegible]	[illegible]

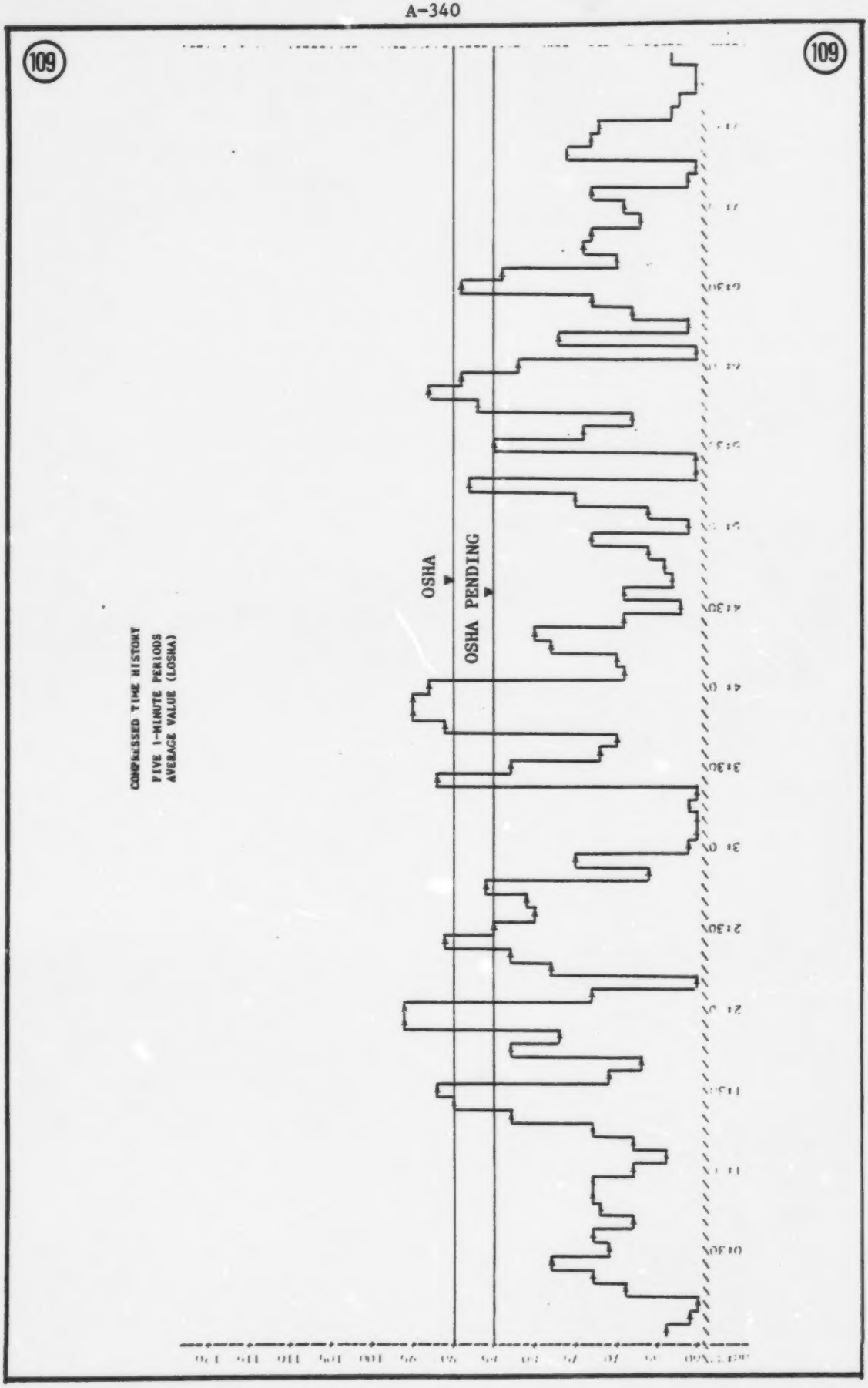
MIN. COEF. = 60 [illegible] MAX. COEF. = [illegible]
ARITHMETIC MEAN = 71 [illegible]
STD. DEVIATION = 12 [illegible]
VARIANCE = [illegible]

AMPLITUDE DISTRISUTION

(109) (109)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
186	40.3	60 TO 64
68	14.7	65 TO 69
58	12.6	70 TO 74
38	8.2	75 TO 79
34	7.4	80 TO 84
22	4.8	85 TO 89
38	8.2	90 TO 94
17	3.7	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 460		




109
109
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(110)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1221    60    64     4     1
    130     115200  480
 61  68  68  70  68  67  66  69  67  60  62  67  68  66  67  63
 63  60  67  62  63  62  60  60  60  60  61  63  60  67  91  88
 90  98  99 102  82  60  60  73  60  60  60  60  60  60  62  74
 66  60  60  60  60  60  60  60  60  71  74  65  69  75  77  60
 60  73  74  60  60  68  61  60  60  60  61  64  61  63  65  63
 72  60  67  94  77  76  71  71  63  73  70  66  65  74  62  72
 70  61  60  60  94  62  66  83  94  99  81  68  73  74  84  66
 71  60  60  78  82  60  60  73  83  87  89  85  85  86  74  72
 76  72  76  68  66  70  64  67  75  98  96  86  62  60  60  60
 60  60  70  60  60  65  60  60  60  60  60  60  60  60  60  60
 74  74  66  68  61  74  70  68  68  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 62  70  69  68  68  70  69  60  60  60  60  60  60  60  60  64
 60  74  70  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  72  60  60  60
 60  60  60  60  60  60  60  60  60  68  76  60  60  60  60  60
 61  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  61  60  60  60  66  72  78  62  61  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  72  60  60  63
 62  66  60  61  60  60  62  60  60  60  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  62  60  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  60  60. 61  60
 60  60  60  62  67  60  63  63  78  90  84  72  60  64  65  60
 60  60  60  60  60  60  60  60  60  60  60  60  62  69  79  88  89
 78  76  78  60  60  60  84  75  63  87  80  60  60  60  60  60
 60  60  60  60  60  60  60  60  60  60  60  60  85  60  60  75  92
 88  84  76  60  60  72  76  78  95  89  83  90  72  60  60  60
 60  71  77  65  79  60  62  60  60  62  60  60  60  68  65  62  63
 66  61  62  64  63  70  69  60  62  73  96  97  96  98  96  92
 99  96  95  97  87  75  66  74  75  60  64  60  63  80  62  76
%EOF
```

(110)

```
ENTER LOG DATE (DD/MM/YR) : 13/08/79
ENTER SITE CODE (5 CHARS) : 0030H
ENTER USER CODE (4 CHARS) : 9574
 ENTER JOB CODE (3 CHARS) : SRIB
```

```
   DATA LOGGED :13  AUG 1979
      LOGGER : 08-301/26
SERIAL NUMBER : 1221
     BASELINE : 60 DB
DYNAMIC RANGE : 24 DB
SAMPLING RATE :  4/SEC
TEST DURATION =   0: 0: 0

DATA ANALYZED : 21 SEPT 1979
    SITE CODE : 0030H
     JOB CODE : SRIB
     USER CODE : 9574
 THRESHOLD :  60 DB
TOTAL SAMPLES =  115200
 STANDBY TIME =    : 0:32
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
LOGS FOR = 00 DAYS / 8 HRS
BACKGROUND (BASELINE) LEVEL = 60 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

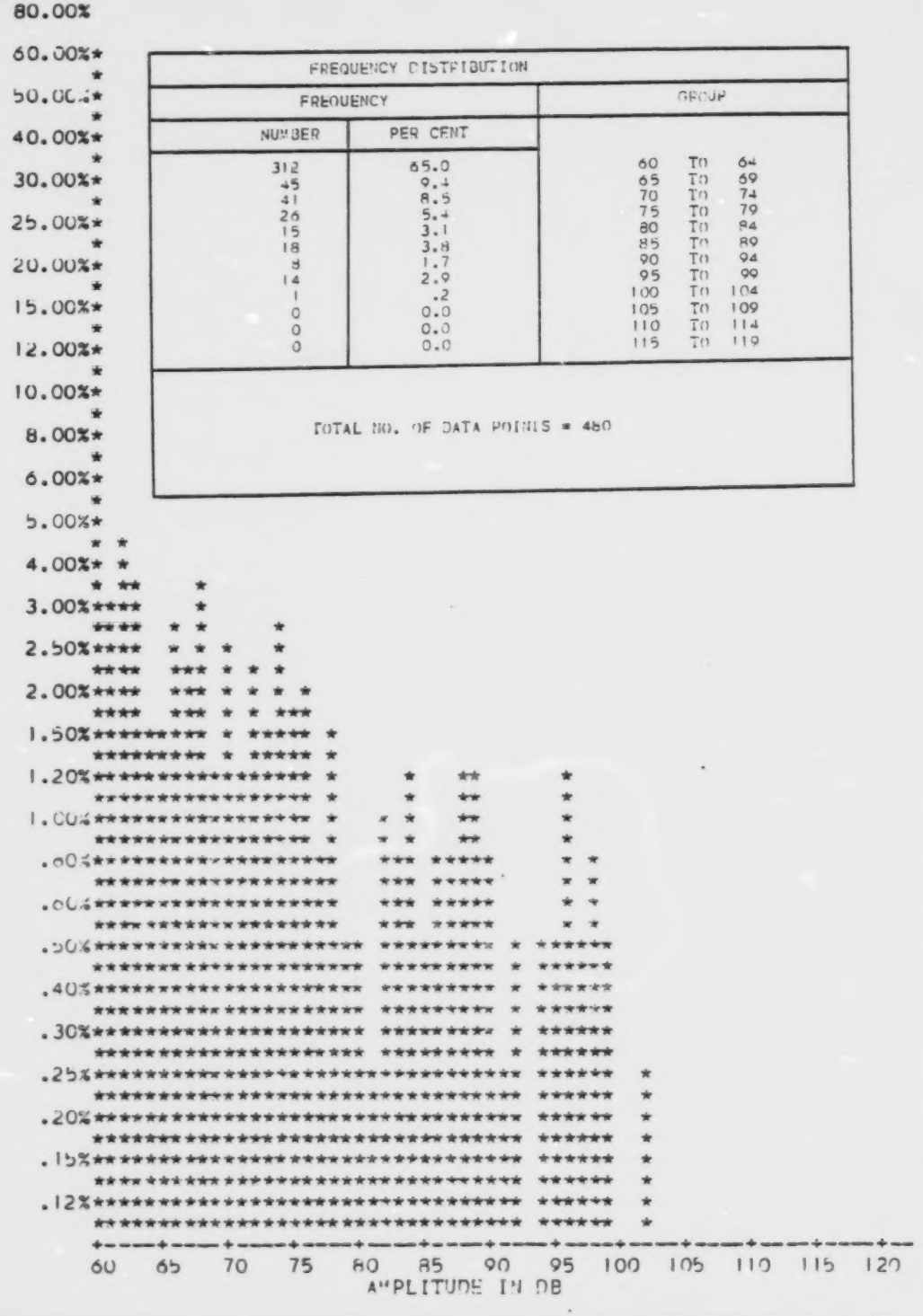
TIME	LEVEL		EXPOSURE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	80.8	80.8	3.474	3.47
2	76.8	79.0	1.996	5.47
3	79.0	79.0	2.719	8.19
4	62.9	77.2	.291	8.48
5	62.7	75.8	.285	8.76
6	61.1	74.7	.229	8.99
7	77.3	75.1	2.176	11.15
8	65.4	74.5	[illegible]	11.77

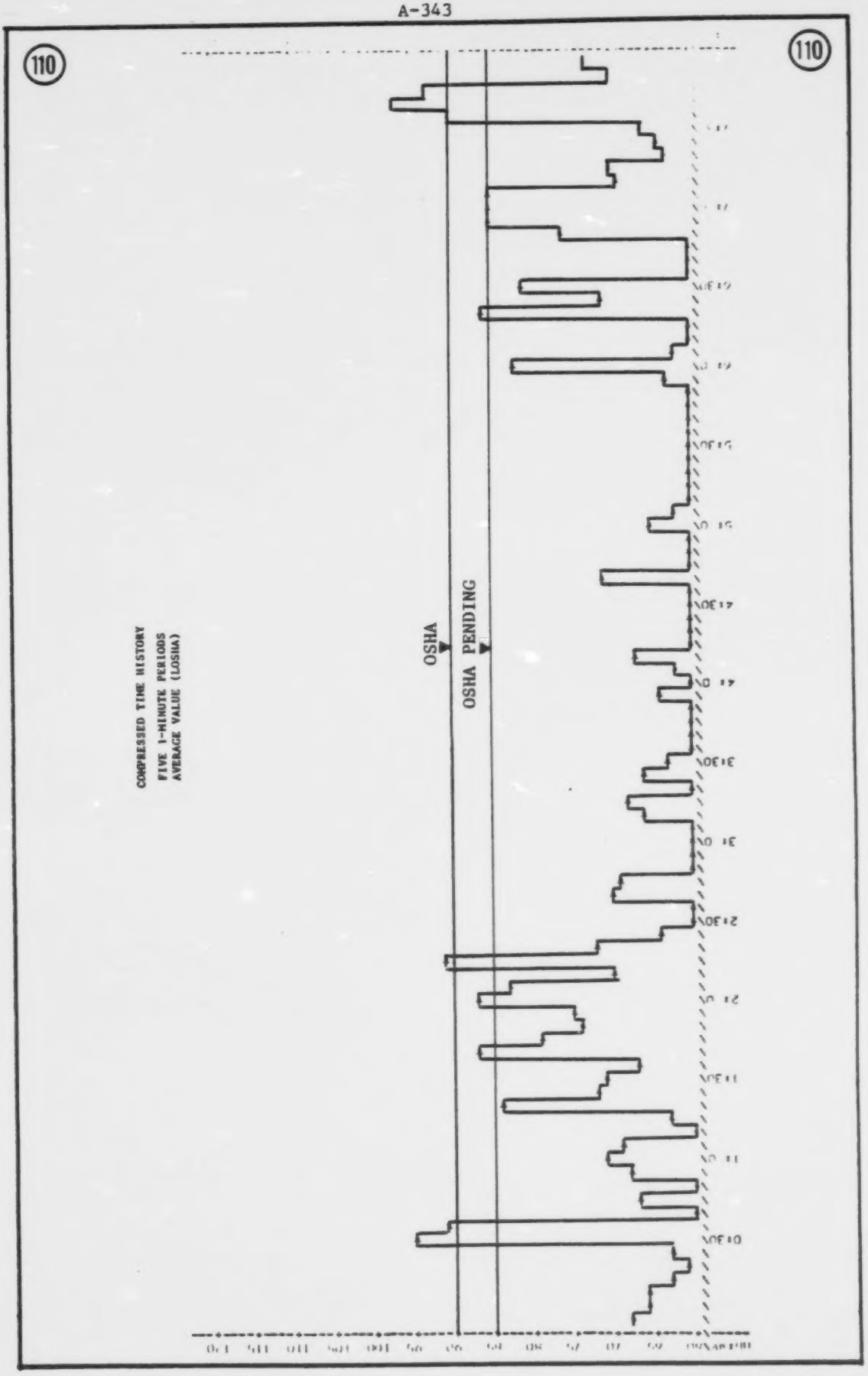
MIN. COMP. = 60 DB MAX. COMP. = 102 DB
ARITHMETIC MEAN = 66 DB
STD. DEVIATION = 10 DB
VARIANCE = [illegible] DB

AMPLITUDE DISTRIBUTION

(110) (110)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
312	65.0	60 TO 64
45	9.4	65 TO 69
41	8.5	70 TO 74
26	5.4	75 TO 79
15	3.1	80 TO 84
18	3.8	85 TO 89
8	1.7	90 TO 94
14	2.9	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119
TOTAL NO. OF DATA POINTS = 480		




110
110
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING

(111)

```
PLACE TAPE IN READER THEN TYPE A "SPACE" AND A "RETURN"
  1  26  80  1213    60    64     4     1
     59      115200  480
 60  60  60  60  60  60  60  60  60  60  60  61  60  60  60  60
 67  60  60  60  62  60  70  61  62  65  66  61  68  70  60  60
 60  64  70  71  70  64  61  60  60  60  68  67  64  71  61  60
 60  60  60  60  64  61  60  60  60  60  61  60  67  73  76  74
 71  71  77  75  70  67  70  70  77  75  63  70  68  70  78  80
 61  63  75  84  70  60  80  73  68  65  73  75  94  85  76  78
 70  90  84  82  84  72  61  73  82  83  90  89  92  92  80  61
 62  80  80  73  85  90  80  80  64  82  77  79  85  76  67  75
 84  78  74  78  80  78  82  74  83  81  84  92 100  98  91  74
 77  67  85  80  91  93  75  75  75  70  61  67  79  77  81  78
 78  82  79  79  89  80  65  80  80  80  80  80  80  85  74  71
 75  67  74  76  74  70  74  69  59  72  74  92  96  94  86  94
 86  93  88  86  88  69  65  77  80  60  60  81  63  61  77  80
 82  82  83  83  74  60  81  83  80  79  83  82  60  60  60  62
 83  82  82  82  82  83  83  83  83  82  83  83  79  80  80  75
 83  82  83  83  83  86  85  80  80  80  80  73  96  71  92  93
 94  80  84  71  63  77  85  85  85  84  72  84  75  94  83  82
 83  91  85  81  94  92  95  91  90  89  86  87  90  91  90  94
 85  62  60  63  62  62  63  62  61  69  79  70  82  80  80  80
 74  60  68  62  62  64  67  71  71  61  65  72  68  77  73  61
 61  60  67  60  60  60  60  60  60  64  60  72  67  60  60  68
 61  60  66  67  64  64  71  69  65  66  60  64  74  64  67  62
 62  65  72  65  67  65  64  74  71  71  63  68  70  64  60  61
 60  60  75  64  60  60  60  63  64  60  60  60  63  60  60  61
 64  60  60  60  60  60  60  61  63  60  60  60  62  70  85  83
 86  84  86  85  90  86  88  86  85  83  84  79  85  63  70  62
 68  71  69  72  65  74  82  93  72  75  80  77  79  69  67  73
 74  61  60  60  62  63  67  76  74  72  76  73  73  70  72  65
 72  74  64  60  60  69  62  84  65  60  60  60  63  60  62  69
 66  74  76  80  63  63  60  61  60  60  60  60  60  60  60  60
%EOF
```

(111)

```
ENTER LOG DATE (DD/MM/YR) : 24/08/79

ENTER SITE CODE (5 CHARS) : 00000

ENTER USER CODE (4 CHARS) : 9590
 ENTER JOB CODE (3 CHARS) : SHI
```

```
   DATA LOGGED :24  AUG 1979                DATA ANALYZED : 25 SEPT 1979
        LOGGER : 05-301/26                      SITE CODE : 00000
SERIAL NUMBER : 1213                             JOB CODE : SHI
      BASELINE :  2.56                           USER CODE : 9590
DYNAMIC RANGE : 54 DB                          THRESHOLD :  60
SAMPLING RATE :  4/SEC                     TOTAL SAMPLES =  115200
TEST DURATION =   8 HR 0 M                   START TIME  =  1:01:17
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE I (EX (L.I.) CALCULATION
ARE ASSUMED TO BE EQUIVALENT
EXCHANGE RATE = 3 DB
THRESHOLD (CUTOFF) LEVEL = 60 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME CODE	LEVEL CURRENT	LEVEL CUMULATIVE	CURRENT EXPOSURE	CUMULATIVE EXPOSURE
1	63.2	63.2	.304	.30
2	80.2	79.9	3.215	3.52
3	73.0	74.1	1.726	5.24
4	63.2	73.3	1.341	6.58
5	82.2	81.0	6.495	13.08
6	66.6	80.5	.487	20.03
7	74.5	80.0	1.937	21.97
8	73.1	79.5	1.295	23.27

MIN. COMP. = 60 DB MAX. COMP. = 101 DB
ARITHMETIC MEAN = 71 DB
STD. DEVIATION = 11 DB
VARIANCE =121 DB

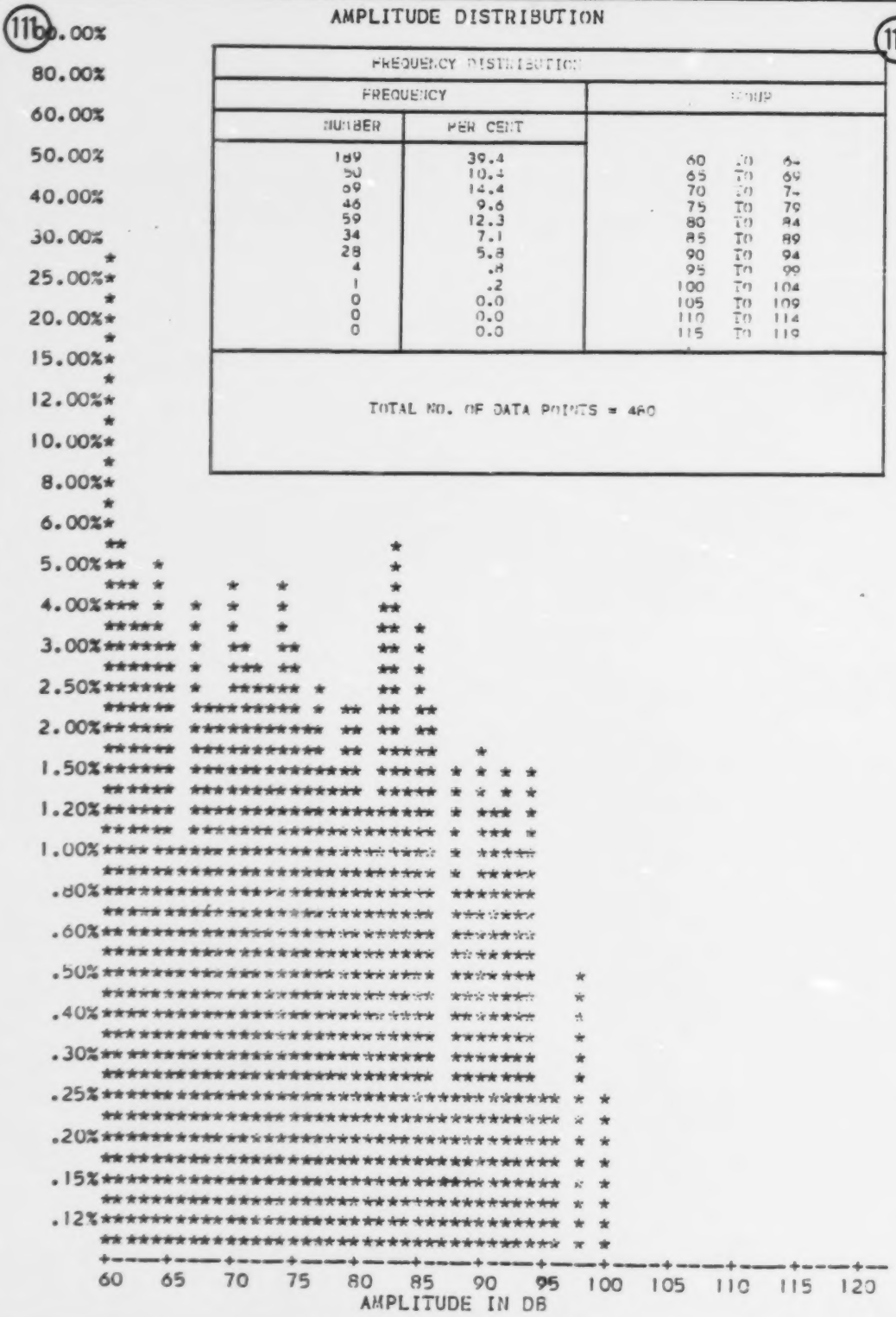
AMPLITUDE DISTRIBUTION

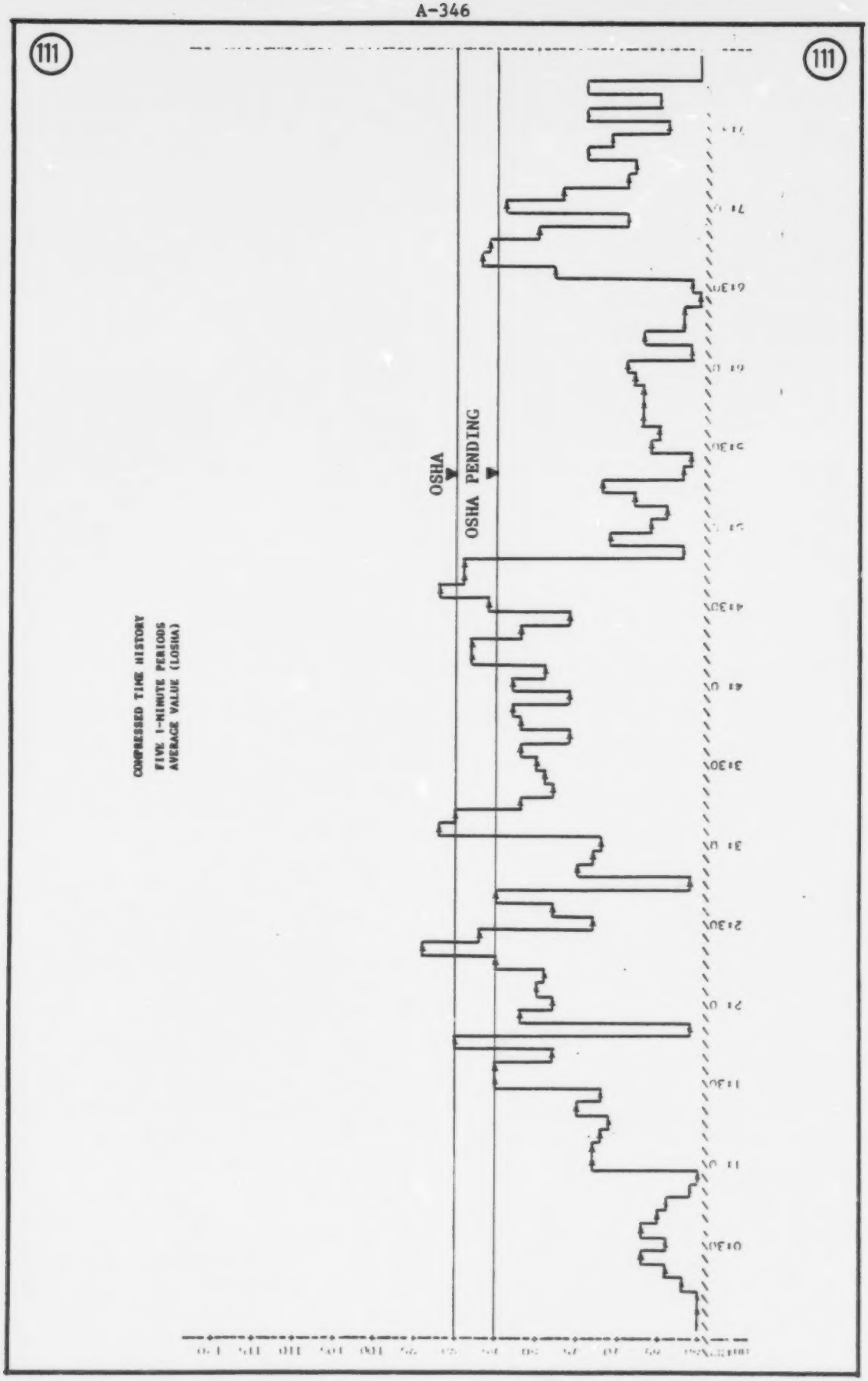
(111b)

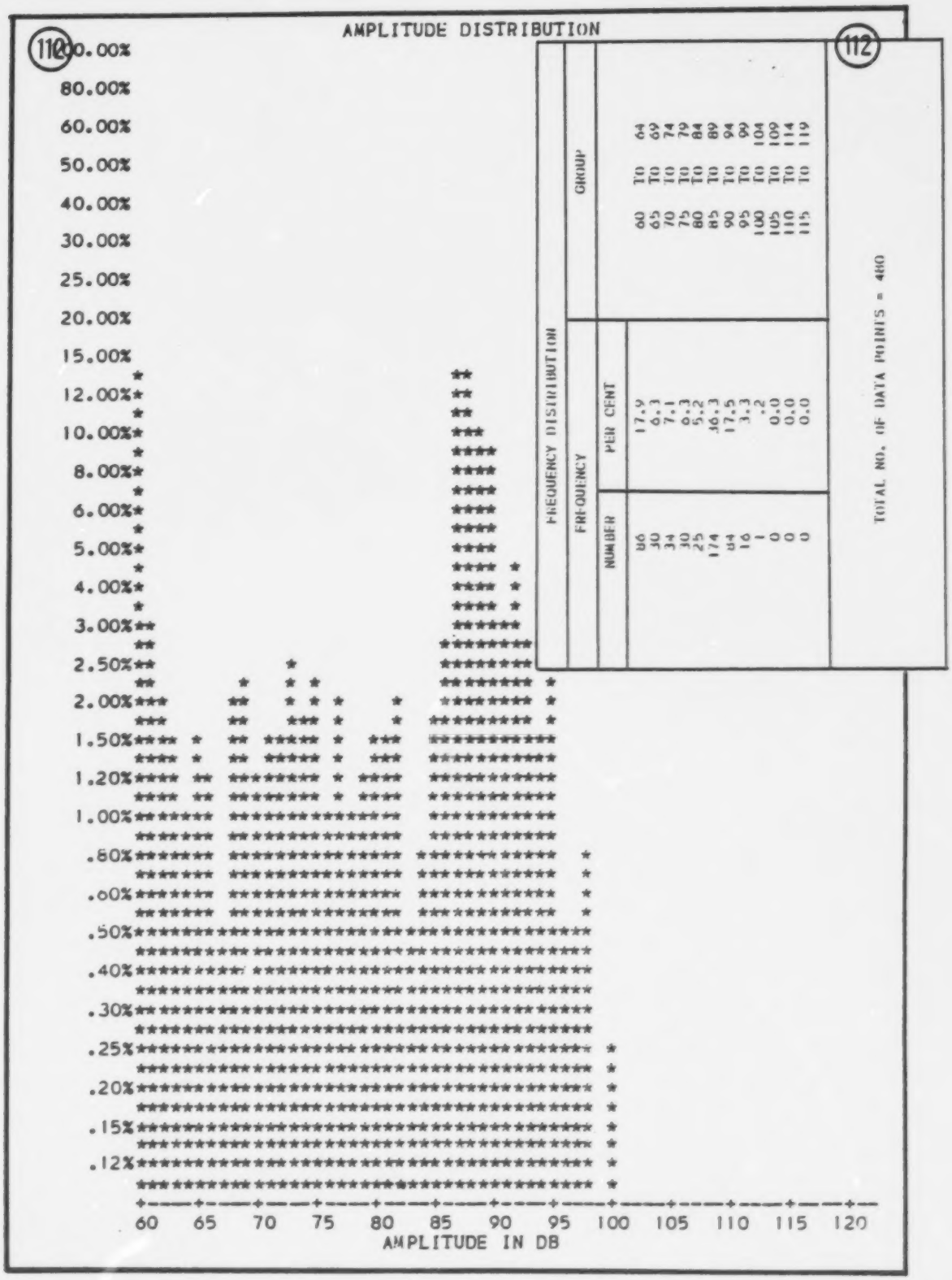
(111)

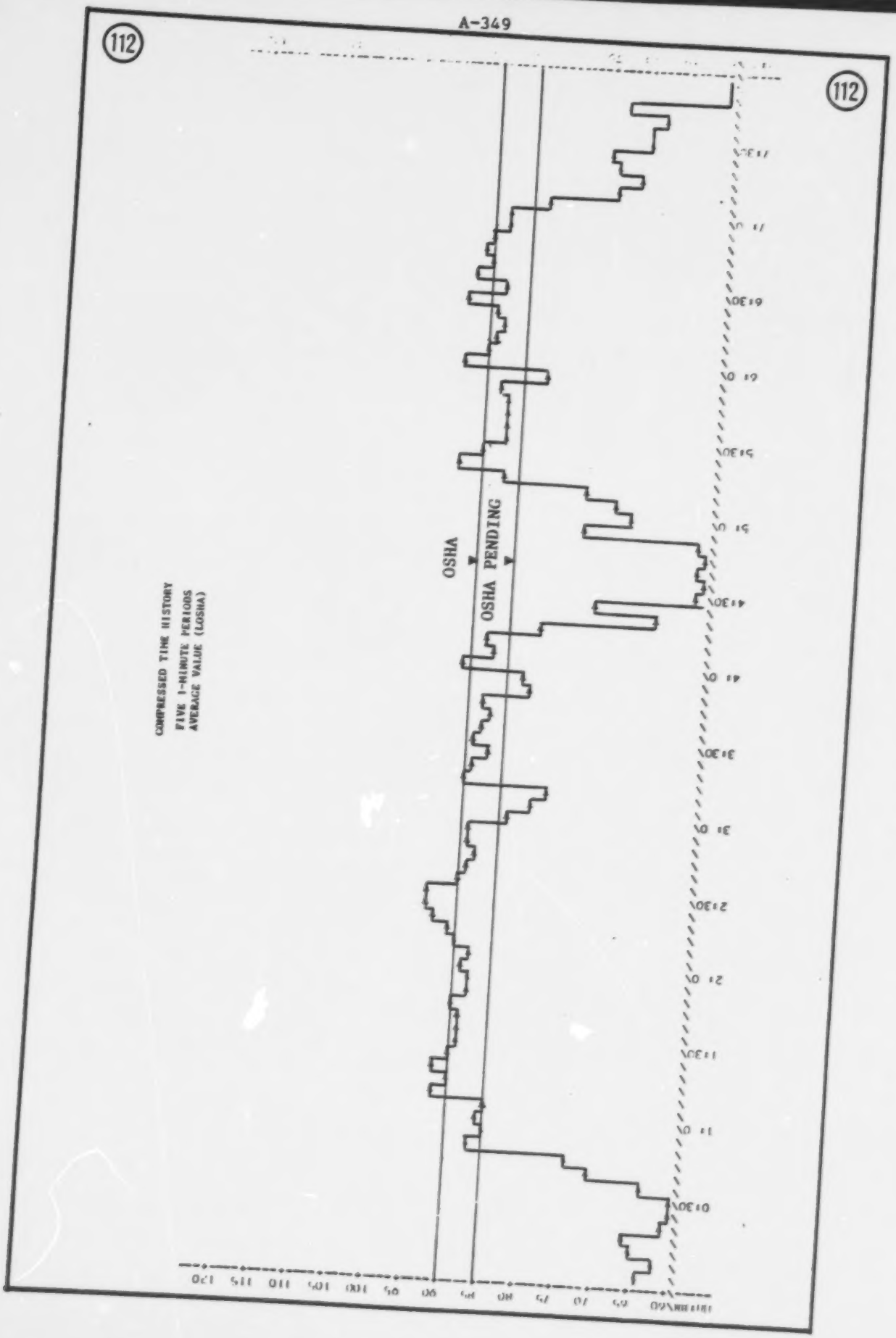
FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
189	39.4	60 TO 64
50	10.4	65 TO 69
69	14.4	70 TO 74
46	9.6	75 TO 79
59	12.3	80 TO 84
34	7.1	85 TO 89
28	5.8	90 TO 94
4	.8	95 TO 99
1	.2	100 TO 104
0	0.0	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480




111
111
OSHA
OSHA PENDING
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)


AMPLITUDE DISTRIBUTION
112
112
80.00%
60.00%
50.00%
40.00%
30.00%
25.00%
20.00%
15.00%
12.00%
10.00%
8.00%
6.00%
5.00%
4.00%
3.00%
2.50%
2.00%
1.50%
1.20%
1.00%
.80%
.60%
.50%
.40%
.30%
.25%
.20%
.15%
.12%
60 65 70 75 80 85 90 95 100 105 110 115 120
AMPLITUDE IN DB
FREQUENCY DISTRIBUTION
GROUP
FREQUENCY
NUMBER
PER CENT
60 TO 64 86 17.9
65 TO 69 30 6.3
70 TO 74 34 7.1
75 TO 79 30 6.3
80 TO 84 25 5.2
85 TO 89 74 16.3
90 TO 94 84 17.5
95 TO 99 16 3.3
100 TO 104 1 .2
105 TO 109 0 0.0
110 TO 114 0 0.0
115 TO 119 0 0.0
TOTAL NO. OF DATA POINTS = 480


112
112
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
01:30
11
11:30
21
21:30
31
31:30
41
41:30
51
51:30
61
61:30
71
71:30
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

(113)

```
PLACE TAPE IN READER THEN TYPE A 'SPACE' AND A 'RETURN'
  1  26  80  1213    60    64     4     1
     619     115200  480
  60  67  60  62  60  64  62  65  60  65  66  74  70  65  60  61
  62  67  62  67  74  65  72  66  64  69  66  71  75  65  67  62
  67  62  60  64  68  60  75  73  68  70  73  64  81  86  90  90
  90  93  91  89  94 100  99 100  99  99 100 103 101  99  99  99  97
  95 100  95  96  94  98  98  96  78  61  60  60  60  60  61  60
  60  60  60  60  60  61  60  60  60  63  60  60  60  60  60  67
  60  60  60  60  60  69  92  98  93  95  98  95  91  82  60  ...
  62  69  76  82  85  91  96  95  98  99  97  77  65  84  45  86
  85  74  67  66  69  78  83  60  68  81  80  92  94  97  92  86
  97  93  82  84  93  97  95 102 104  94  98  96  97  94  78  93
  94  96  95  73  83  95  98  89  47  96  97  96  76  76  85  85
  84  83  84  82  82  82  82  82  82  82  82  82  84  82  82  83
  84  84  88  94 100  76  75  88  96  93  97  97  98  94  84  94
  93  98  86  90  93  94  94  96  95  89  60  60  60  60  60  67
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60  60
  60  60  60  60  60  60  60  60  60  60  60  61  60  60  60  60
  60  60  60  60  61  63  60  60  60  60  60  60  60  74  95  93
  81  81  82  97  98  98  85  83  84  85  92 101  71  73  72  76
  90  94  97  99  94  96  77  85  86  82  95  96  89  76  87  91
  87  85  88  85  86  81  95  97 100 100 100  89  91  91  92  87
  94  89  96  70  72  86  97  88  93  96  94  97  97  97  98  95
  93  93  99  98  93  92  93 101 100 102  98  94  90  60  60  62
  60  60  83  60  60  60  60  60  60  60  60  60  60  60  63  84
  83  83  83  82  60  60  60  60  60  60  80  67  60  60  60  79
  77  78  74  74  79  68  60  60  60  60  60  60  60  60  60  60
  60  66  60  60  63  60  60  60  60  60  60  60  60  60  60  60
  60  60  63  60  60  60  60  60  60  60  67  60  63  61  80  92
  94  96  93  95  93  88  93 100  98  97  97  93  96  80  64  60
%EOF
```

(113)

```
ENTER LOG DATE (DD/MM/YR) : 27/07/79

ENTER SITE CODE (5 CHARS) : 205LL
ENTER USER CODE (4 CHARS) : 9637
 ENTER JOB CODE (3 CHARS) : FOR
```

```
    DATA LOGGED :27 JULY 1979          DATA ANALYZED : 20 SEPT 1979
         LOGGER : DB-301/26                 SITE CODE : 205LL
SERIAL NUMBER : 1213                        JOB CODE : FOR
       BASELINE : 60 DB                   USER CODE : 9637
DYNAMIC RANGE : 64 DB                     THRESHOLD : 80 DB
SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
TEST DURATION =   8: 0: 0              STANDBY TIME =   0: 2:34
```

TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
NUMBER OF COMPUTATIONS = 480
PERIOD = 1 MINUTES

TIME	LOGIA		DOSE	
HOUR	CURRENT	CUMULATIVE	CURRENT	CUMULATIVE
1	87.2	87.2	8.474	8.47
2	89.6	88.5	11.828	20.30
3	92.4	90.1	17.473	37.78
4	88.0	89.6	9.423	47.20
5	80.1	88.0	.198	47.40
6	91.9	88.8	16.192	63.59
7	89.5	88.9	11.630	75.22
8	89.1	88.5	6.311	81.53

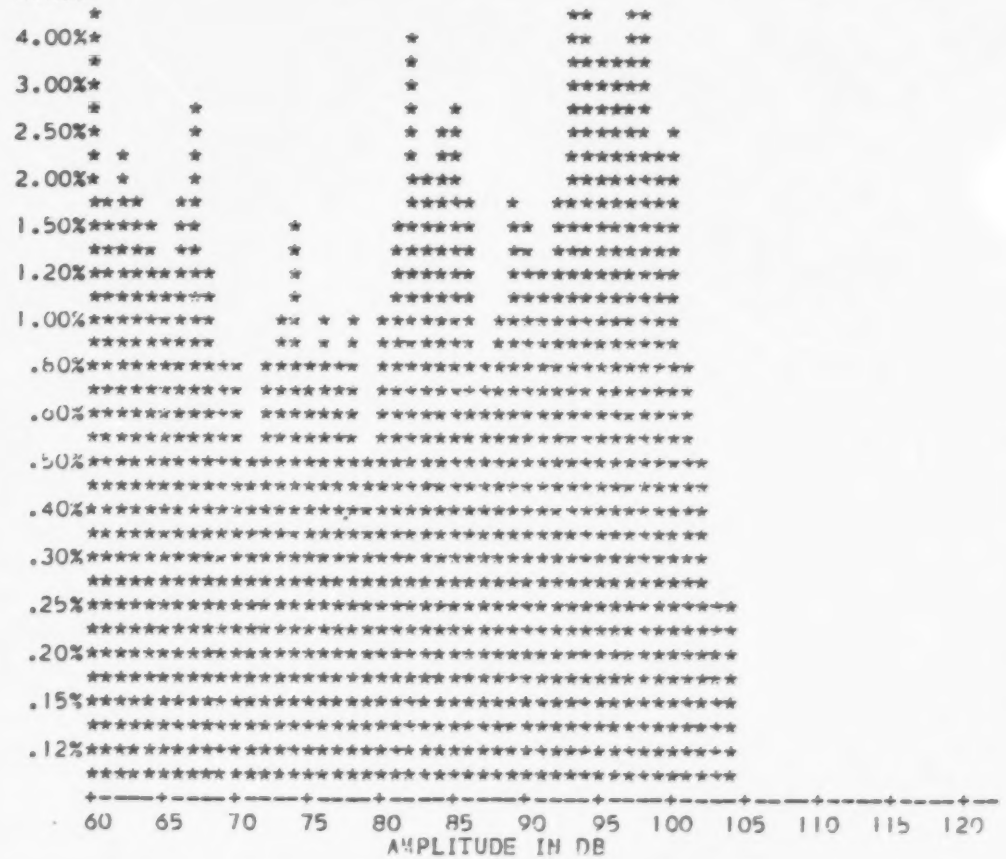
MIN. COMP. = 80 DB MAX. COMP. = 104 DB
ARITHMETIC MEAN = 76 DB
STD. DEVIATION = 5 DB
VARIANCE =25 DB

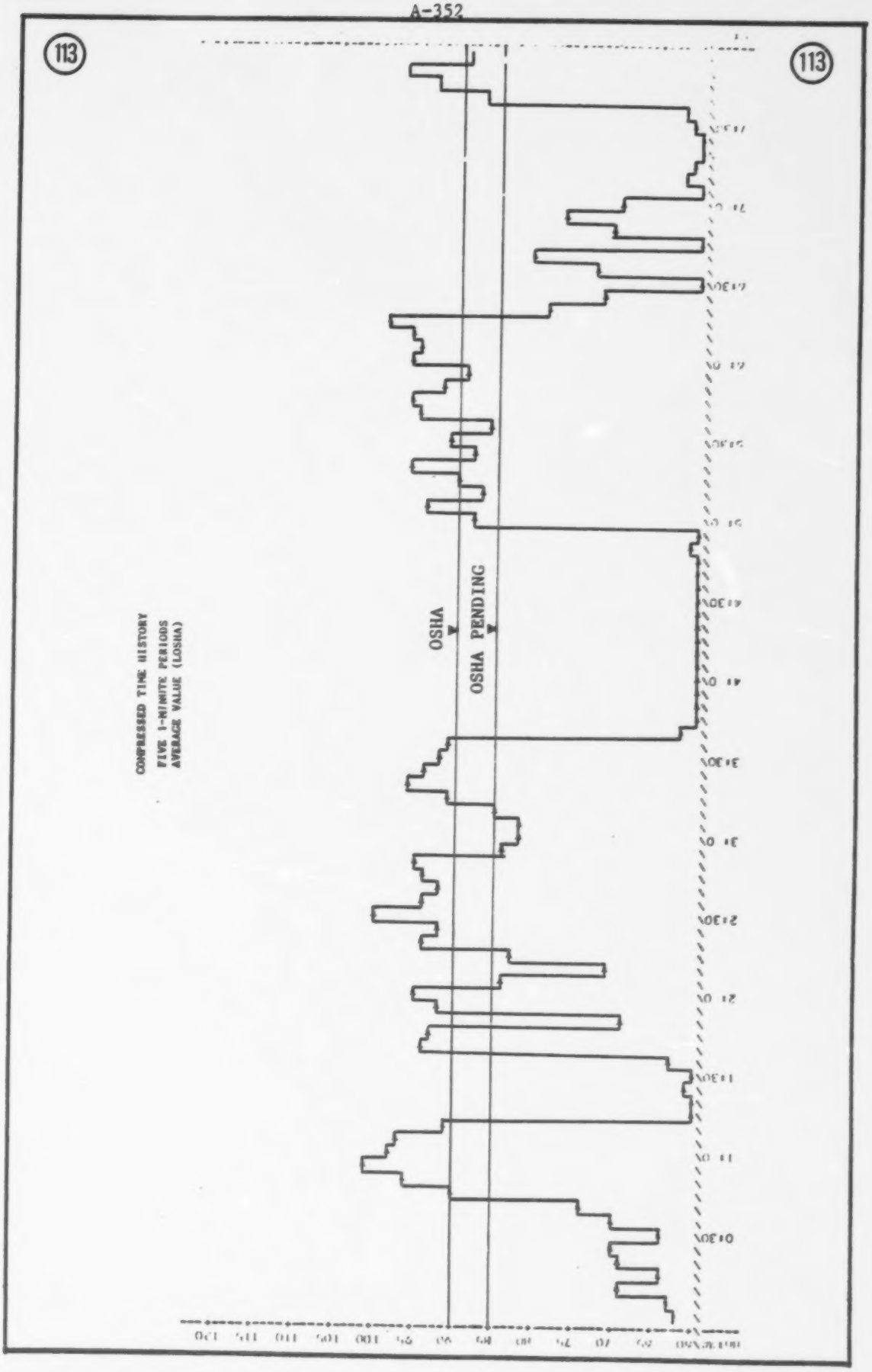
AMPLITUDE DISTRIBUTION

(112) (113)

FREQUENCY DISTRIBUTION		
FREQUENCY		GROUP
NUMBER	PER CENT	
197	41.0	60 To 64
31	6.5	65 To 69
18	3.8	70 To 74
16	3.3	75 To 79
44	9.2	80 To 84
32	6.7	85 To 89
52	10.8	90 To 94
73	15.2	95 To 99
17	3.5	100 To 104
0	0.0	105 To 109
0	0.0	110 To 114
0	0.0	115 To 119

TOTAL NO. OF DATA POINTS = 480




113
113
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
0+30
1+30
2+30
3+30
4+30
5+30
6+30
7+30
8+30
9+30
10+30
11+30
12+30
13+30
14+30
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39+30

(114)

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    122     115200  480
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  87  95 100  96  97 101  90  95 100  99  97  99  91  88  96  99
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  60  74  69  69  60  60  60  60  67  69  64  67  90  97  93  95
  95 101  87  72  61  61  60  60  60  60  60  60  60  60  60  60
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  86  81  84  81  80  80  78  68  74  60  60  62  60  60  66  82
  75  72  83  79  60  60  60  60  60  60  60  87  91  78  68  78
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  66  63  67  70  71  69  69  63  64  65  61  67  64  63  69  64
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  88  94  92  88  80  73  87  96 109 108 104 101  93  93  92  88
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  73  64  60  63  60  60  60  61  60  62  63  60  60  66  66  60
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%EOF


ENTER LOG DATE (DD/MM/YR) : 30/07/79
ENTER SITE CODE (5 CHARS) : 00448
ENTER USER CODE (4 CHARS) : 9614
 ENTER JOB CODE (3 CHARS) : FOR


   DATA LOGGED :30 JULY 1979          DATA ANALYZED : 20 SEPT 1979
        LOGGER : DB-301/26                 SITE CODE : 00448
 SERIAL NUMBER : 1216                       JOB CODE : FOR
      BASELINE : 60 DB                     USER CODE : 9614
 DYNAMIC RANGE : 64 DB                      THRESHOLD : 80 DB
 SAMPLING RATE :  4/SEC                TOTAL SAMPLES =  115200
 TEST DURATION =   8: 0: 0             STANDBY TIME =   0: 0:30

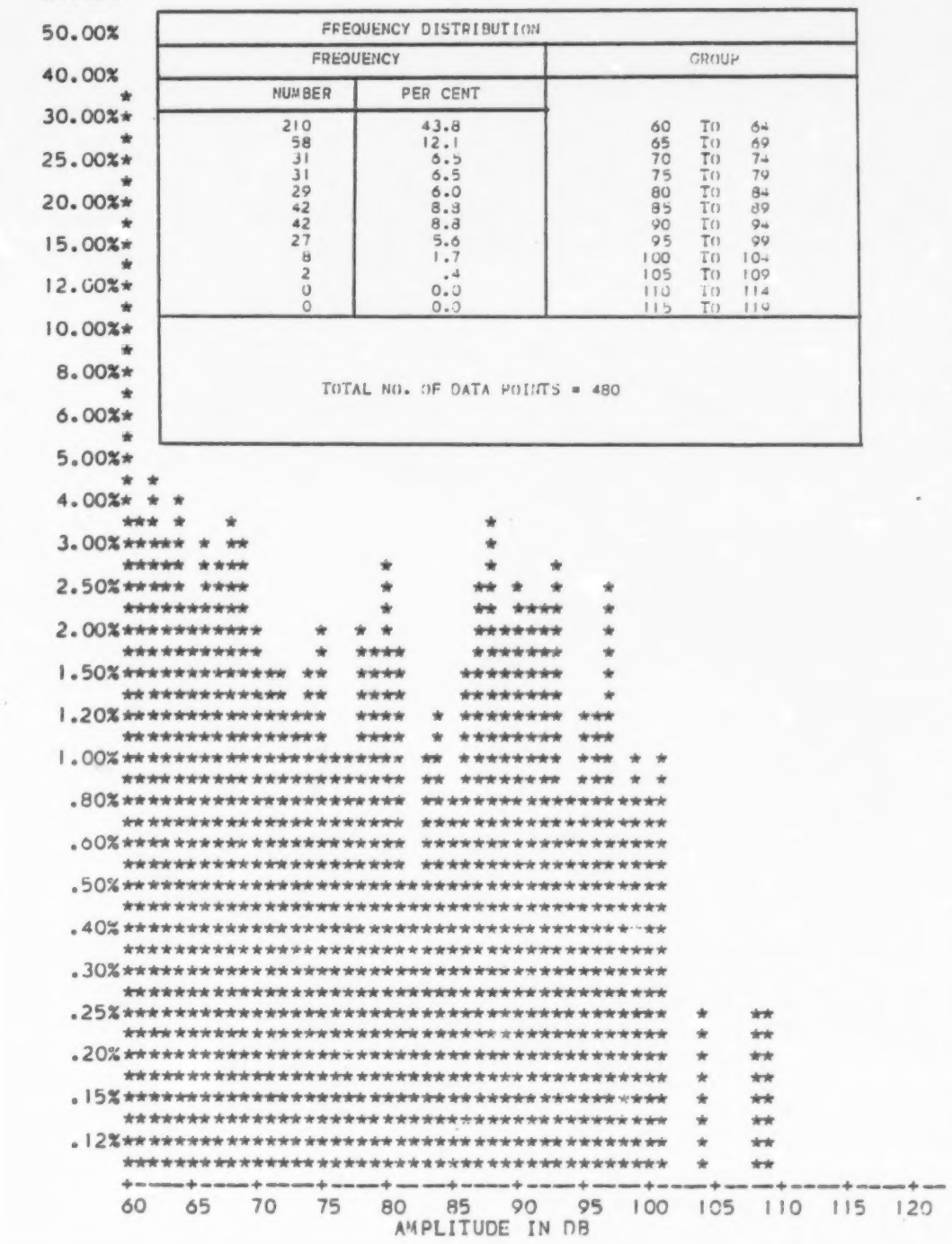
          TIME HISTORY ANALYSIS

NOISE EXPOSURE INDEX (N.E.I.) CALCULATIONS
ARE BASED ON THE FOLLOWING:
100% DOSE = 90 DB / 8 HRS
EXCHANGE (DOUBLING) RATE = 5 DB
THRESHOLD (CUTOFF) LEVEL = 80 DB
  NUMBER OF COMPUTATIONS = 480
PERIOD =  1 MINUTES

TIME          LOSHA                        %DOSE
HOUR    CURRENT  CUMULATIVE        CURRENT  CUMULATIVE
   1       91.0       91.0         14.342       14.34
   2       81.4       87.7          3.809       18.15
   3       79.1       85.8          2.767       20.92
   4       84.9       85.6          6.121       27.04
   5       74.2       84.3          1.404       28.44
   6       67.2       83.1           .533       28.97
   7       83.8       83.2          5.244       34.24
   8       91.8       85.0         16.050       50.29
MIN. COMP. =  60 DB                MAX. COMP. = 109 DB
ARITHMETIC MEAN =  72 DB
STD. DEVIATION =  13 DB
VARIANCE =169 DB
```

(114)

(114) AMPLITUDE DISTRIBUTION (114)



FREQUENCY DISTRIBUTION

FREQUENCY		GROUP
NUMBER	PER CENT	
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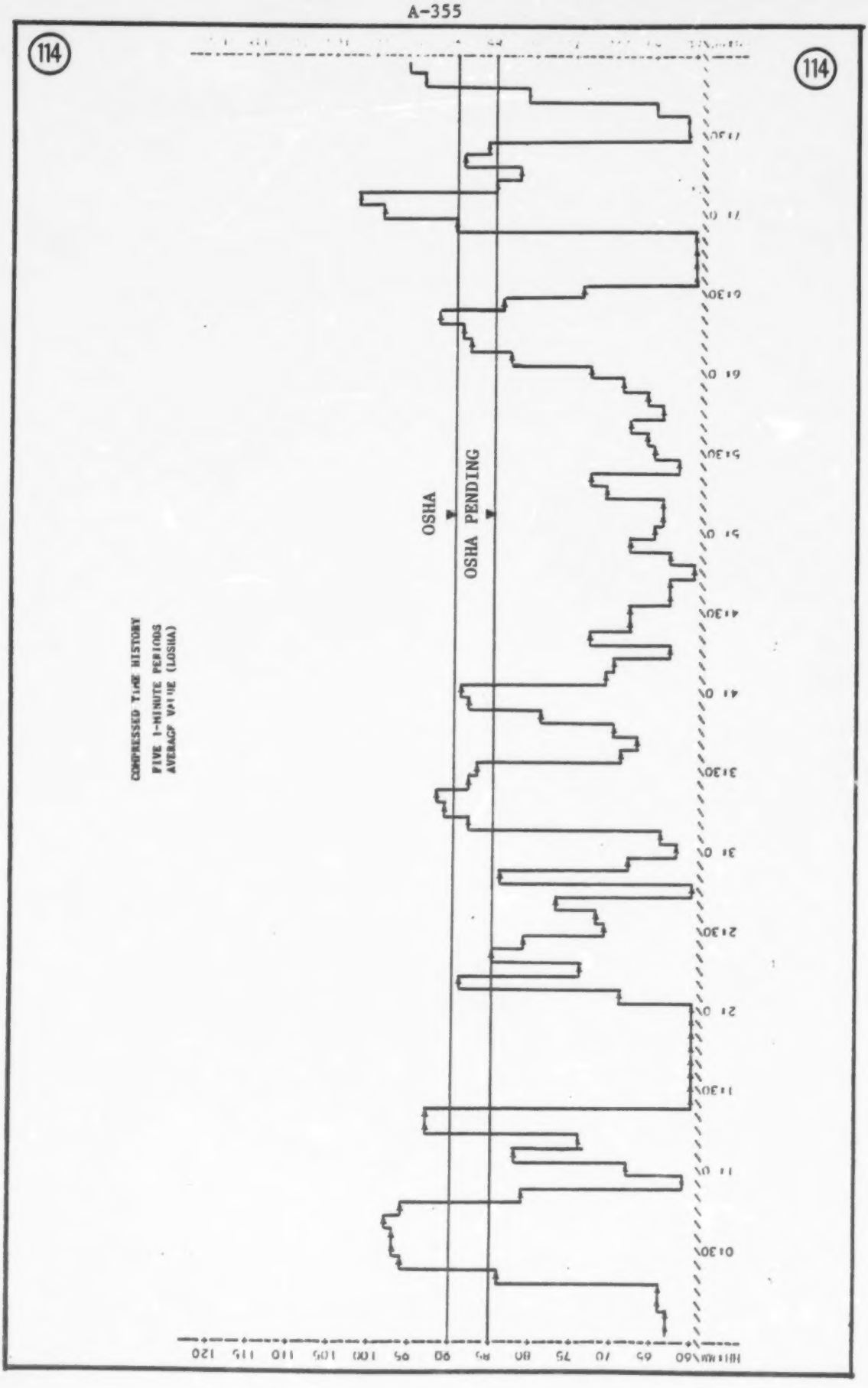
58	12.1	65 TO 69
31	6.5	70 TO 74
31	6.5	75 TO 79
29	6.0	80 TO 84
42	8.8	85 TO 89
42	8.8	90 TO 94
27	5.6	95 TO 99
8	1.7	100 TO 104
2	.4	105 TO 109
0	0.0	110 TO 114
0	0.0	115 TO 119

TOTAL NO. OF DATA POINTS = 480


114
114
COMPRESSED TIME HISTORY
FIVE 1-MINUTE PERIODS
AVERAGE VALUE (LOSHA)
OSHA
OSHA PENDING
HR:MN\60 65 70 75 80 85 90 95 100 105 110 115 120
0:30\
1: 0\
1:30\
2: 0\
2:30\
3: 0\
3:30\
4: 0\
4:30\
5: 0\
5:30\
6: 0\
6:30\
7: 0\

APPENDIX 2

Standard job procedure: conventional stope drilling operator

1. When an employee comes to work, his first duty is to report to his shift boss and give him his check-in card.

2. His shiftboss will greet him with a good morning or good evening, discuss the log written by the previous shift on existing conditions and work performed. Discuss any irregularities that may have taken place (i.e., stope working, a series of faults, or loose ground conditions).

3. A safety slip is given to the men with their instructions for the shift written on it. A bit slip is then issued by the supervisor with the required amount of bits written in to perform the shift's work.

4. A commitment to work safely and productively is given by the crew to their supervisor before leaving the wicket.

5. When the men leave the wicket they go directly to the bit room and give their bit slip to the bit man. In return, the bit man gives the men the number of bits indicated on the bit slip. The men count the bits that are in the bag to verify that the right amount of bits are there.

6. The men then go to the toolroom to get a can of paint, a spool of blasting wire and any other material that they may require to perform their shift's work.

7. They will then go to the first aid to pick-up ear plugs and if required, have safety lens changed on their glasses, bandages and aspirins.

8. Then they proceed to the deck where they will await their cage that will transport them to the level they work on.

9. When they arrive on the level, they will check at the station for any repaired machines that may belong to their working place (i.e., stopers, jackleg machines).

10. The men are then transported by mancar to the closest entrance to their work place. The men will then go directly to their work place.

11. On their way into their work place they will check the travelway and the entrance to ensure there is no loose or any irregularities.

12. At the entrance to their work place they put the blasting box handle on short, wash down the slusher platform, check to see if atomizers are on and ensure that box hole guards are up. A visual check is given of the surroundings for good housekeeping. One of the crew enters from top of the stope, removes the slushing sign. The blasting box handle is put on short, the entrance and raise checked and scaled on their way down to the face. All crews responsible for both entrances to stope.

13. When the crew are in the work place they check the area over good for sounding back, wash and scale, give the face and back a visual check to ensure there are no misholes, see what the ground conditions are like and to see how well the previous blast broke. At this time, they also formulate their plans for the shift.

14. The crew will then commence to set up their gear. They blow their air hoses and run the water through their water hoses to ensure that there is no rust in the pipes to plug up their machines.

15. The simplex post is then installed against the back two and a half (2½) feet away from the nearest bolt. The stoper is brought to where the man is going to start bolting. (From raise towards face), the air and water hose is connected, the lubricator is filled and the rest of the gear is brought in (i.e., 2 scaling bars, 1-6' long and one 8' long, drill steel, 2'-4'-6' and possibly a 7' steel 6' rock bolts, rock bolt plates, paint, gad driver, cable and a dolly.

16. The men will then proceed to bolt. As the man bolts, he scales the face, washes marks and flags the lifters. It would be noted that when the man starts bolting, he stands under the existing bolts, that's in the back, he starts from within the raise and works down and across. Also, his simplex post is at all times a distance of two and a half (2½) feet away from him and his scaling bars are within easy reach.

17. After an area of 120 sq. feet has been bolted, (i.e., 10' x 12'), the second driller will set up the jackleg machine, blow his air hose, fill his lubricator, run the water through the water hose and bring his gear to the face. Work up pillar and drill lines.

18. After lunch break is finished (time ranges from ten minutes to half an hour) the man that was bolting will go for the powder and fuse. When the second man has completed the drilling on the face, both men will remove all the gear from the face and pile it neatly in the raise far enough away from the blast so it won't get damaged. One air hose, minus the lubricator, and the scaling bars are left at the face. The air hose is connected to the anex loader and the loading operation starts. When the loading operation is completed, one man will install the thermolite on the face while the other man removes and coils the air hose and removes the scaling bars and cleans the loader.

19. Every second blast of the complete face, one section of the air and water lines are removed from the raise so that pipe will not get damaged by the blast.

20. During loading operation, ensure that fuse are not being bent and pushed into holes. This will cause misholes and check to see that holes are properly loaded and anex is packing in holes properly.

21. A visual check is given of the work area to ensure that none of the gear was forgotten, the lead wire is run from the face to the blasting box, but not connected. The lead wire is tested with a tester (i.e. small battery), the electric starter is tested. The electric starter is then attached to the thermolite. The lead wire is then connected to the starter. (Blasting wire and electric starter are tested for breaks or defects). When everything tests OK, the lead wire is then connected to the blasting box and the handle is put in the fire position. It should be noted that under no circumstances is the blasting handle to be put into the fire position until quitting time.

22. Both men then proceed to the refuge station (lunchroom), report their accomplishments to their supervisors, discuss any irregularities which may exist or occurred, report defective equipment, shortage of material and give their safety slips. They then await the departure of the man car to the station.

83-114(TR) D.T. McPhee, R.M. Van Ooteghem and M.V. Savich

Short noise measurements on fans at Fraser and Strathcona mines

1983

SHORT NOISE MEASUREMENTS ON FANS AT FRASER AND STRATHCONA MINES

by

D.T. McPhee*, R.M. Van Ooteghem** and M.U. Savich+

ABSTRACT

Noise measurements were taken from fans located near the 34 level diesel repair shop at Fraser Mine as requested by the Ontario Ministry of Labour. Noise measurements were also taken from the ventilation system in the 23-24-C7 West Drift on the 2375 level in Strathcona Mine as requested by the Mine's ventilation department.

Measurements were taken with an Octave Band Analyzer, (measures noise in various frequencies from 31.5 Hz to 8000 Hz as well as the dBA) and a Sound Level Meter (assesses noise levels on the dBA network in slow and fast response, peak noise and the 60s L_{eq} or one minute noise average). For each area the noise measurement procedure was the same. Standard measurements were located in front of each fan (fan inlet). Measurements were also obtained at the fan casing and along the duct to measure their noise transmission losses.

In the diesel garage the noise level is approximately 86 dBA but can be variable from 83 dBA to 85 dBA. The peak noise in the shop ranges from 95 to 98 dBA. At the fan outlet outside the garage the dBA is 92 dB and the peak noise is 106.7 dBA. Noise levels do conform to Ontario regulations but are relatively high for overall workplace comfort. Suggested methods to attenuate noise are to relocate fan as far as possible from the garage entrance, install acoustical curtains on the shop ceiling near the fan inlet and install elbows in existing ductwork. Measurements in the 23-24-C7 West Drift indicate that the noise level around all three fans is approximately the same (102 dB). Engineering solutions to reduce this noise to a comfortable level are very expensive and impractical. It is suggested that proper hearing protection be worn in this area regardless of exposure duration.

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+ Research Scientist, Elliot Lake Laboratory, CANMET, Energy, Mines and Resources Canada, Elliot Lake, Ontario.

MESURES SOMMAIRES DU BRUIT DE VENTILATEURS DANS LES MINES DE FRASER ET DE STRATHCONA

par

D.T. McPhee*, R.M. Van Ooteghem** et M.U. Savich +

RÉSUMÉ

Des mesures de bruit ont été effectuées sur des ventilateurs proches de l'atelier de réparations d'engins diesel situé au niveau 34 de la mine de Frazer, à la demande du ministère du Travail de l'Ontario. Des mesures de bruit ont été également effectuées sur le système de ventilation du puits ouest 23-24-C7, au niveau 2375 de la mine de Strathcona, à la demande du service de ventilation de la mine.

Les mesures ont été effectuées à l'aide d'un analyseur de bruit à filtres de 1 octave (mesure le bruit rattaché aux fréquences comprises entre 31.5 et 8000 Hz, ainsi que les niveaux en dBA) et d'un sonomètre (évalue les niveaux sonores à l'échelle dBA suivant une réponse lente ou rapide, ainsi que le niveau sonore maximal et le niveau mesuré sur un temps équivalent moyen d'exposition de 60 s, soit une minute). La méthode de mesure employée a été la même à chaque endroit. Des mesures standard ont été effectuées devant chaque ventilateur (orifice d'admission). Des mesures ont été également effectuées près de l'enveloppe des ventilateurs et le long des gaines de ventilation pour mesurer leurs pertes sonores.

Dans le garage d'engins diesel, le niveau sonore est d'environ 86 dBA mais peut varier de 83 à 85 dBA. Le niveau sonore maximal dans l'atelier s'étale entre 95 et 98 dBA. Aux orifices d'échappement des ventilateurs, hors du garage, le niveau sonore est de 92 dBA et le niveau sonore maximal, de

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106.7 dBA. Ces niveaux satisfont à la réglementation de l'Ontario mais sont relativement élevés pour être supportés dans des lieux de travail. Les méthodes suggérées pour atténuer le bruit consistent à: éloigner au maximum les ventilateurs de l'entrée du garage; installer des panneaux d'isolation acoustique au plafond de l'atelier, près de l'orifice d'admission du ventilateur, et installer des coudes dans les gaines de ventilation existantes. Des mesures effectuées dans le puits ouest 23-24-C7 indiquent que les niveaux sonores près des trois ventilateurs sont à peu près identiques (102 dBA). Les solutions permettant de réduire ce bruit à un niveau acceptable sont très onéreuses et peu pratiques. On suggère aux ouvriers de porter des protège-tympans, quel que soit le temps d'exposition au bruit.

INTRODUCTION

The fans in underground mines emit noise at levels that are potentially harmful.

One of the most important aspects of any fan noise measurement procedure should be a standardized acceptance test for fans. Unfortunately at the present time there is no accepted procedure for evaluating an acoustical system (e.g., ventilation system) underground. Work is being done on this problem but proposals are not yet in final form.

However, the method of evaluating the sound power level generated by the fan itself is well established and specified by the AMCA* Test Code for sound rating (300-67) and from an ASHRAE** standard (36-62). This specific fan testing procedure could be included in a standardized underground field test for noise measurement on fans. To be practical as a complete routine a compliance check on this procedure should be performed by persons with acoustical measurement experience.

The real problem in any noise measurement technique on fans is to establish the average sound pressure level value. Noise is generated by the fan wheel and is radiated from the fan wheel through the fan outlet, the fan inlet, and to some extent through the fan casing. The amount of noise radiated through the fan inlet is approximately equal to the amount of noise radiated through the fan outlet. The amount of noise radiated through the casing is not evaluated by the present code and is difficult to estimate due to differences in fan housing construction. However, it is possible to get some estimate of this noise component. Generally, the paths of sound transmission from a fan may be summarized as:

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* Air Moving and Conditioning Association.
** American Society of Heating, Refrigerating and Air-Conditioning Engineers.

i) sound from the inlet and outlet

ii) sound radiated through the fan casing

iii) sound radiated through the ducts, and

iv) sound induced by vibrations transmitted to adjoining structures. (not largely applicable to mines).

The sound radiated from the housing would be the total sound power level minus the transmission loss through the casing. If ducts were connected to the inlet and outlet of the fan the sound level outside would be attenuated by the transmission loss of the duct. For the determination of sound power level, three formulae can be used, originally developed by Beranek, which have been found to give reasonably accurate predictions. They are listed as follows:

$$SWL = 77 + 10 \log kW + 10 \log P \text{ dB}$$

$$SWL = 25 + 10 \log Q + 2 - \log P \text{ dB}$$

$$SWL = 130 + 20 \log kW - 10 \log Q \text{ dB}$$

where, SWL = overall sound power level in the octave frequency bands from 31.5 Hz to 8000 Hz

kW = rated motor power, kW

P = static pressure developed by the fan, mm w.g.

Q = volume flow delivered, m^3/h

Any one of the above formulae may be used depending upon which details of the system are known. Actually, this type of evaluation would be incorporated into a much larger study of noise in mine ventilation systems. In the present situation, the evaluation of sound power level is not necessary because the measurement of sound pressure level indicates the potential of a noise source to cause hearing impairment.

Sound radiated through ducts has a very large influence in mines. A

typical fan problem is one in which the noise of the fan through the duct exceeds the specified noise criteria. A method of reducing the fan noise in this case is by lining the duct before or after the elbow with some acceptable noise damping or sound absorptive material. The analysis of the acoustical treatment of duct systems also required the measurement of the sound pressure level.

FAN NOISE MEASUREMENT AT FRASER MINE

On October, 3, 1983, the Ontario Ministry of Labour requested that Fraser Mine management provide a noise measurement survey in the 34 level garage (34-554 Diesel Repair Shop).

Measurements were taken outside the garage on the 24 inch diameter, 25 H.P., Woods fan with two silencers attached. Two measurements were taken on the fan outlet and the fan casing with a Sound Level Meter (SLM) and an Octave Band Frequency Analyzer (Table 1 and Appendix A).

Measurements of noise were taken at various frequencies and on the dBA network with the Octave Band Analyzer. The dBA noise measurement obtained in the field was then compared with the estimated dBA value. The estimated dBA is derived from the dB noise readings measured with the Octave Band Analyzer. Also, the sound pressure level (SPL) was measured in slow and fast response, peak and L_{eq} (one minute noise averaging).

At the fan outlet dBA was 92 dB and the peak noise was 106.7 dBA. The L_{eq} was 93.5 dBA which gave approximately the same result as the estimated dBA from the frequency analysis. Fast and slow responses on the Sound Level Meter gave the same result. Fan casing noise is lower by approximately 2 to 3 dB. In the diesel repair shop, (measurement 3, Appendix A) the noise level was around 86 dBA. Results in the garage show that the noise is variable from

Table 1 - Noise survey at diesel repair shop, Fraser Mine, 34 level.

Location	Frequency(Hz)									dBA						Comments
	31.5	63	125	250	500	1k	2k	4k	8k	Meas'd	Est'd	SPL(slow)	SPL(fast)	Peak	Leq	
1	77	79	84	84	90	91	82	74	67	92	93.1	93.5	93.5	106.7	93.5	Fan outlet
2	77	78	82	83	87	86	81	75	70	89	89.5	91.5	90.5	104.8	91.5	Fan Casing
3	74	72	74	80	87	82	73	60	54	86	86.5	86	85	98.8	86.5	In shop-fan side (Entrance)
4	75	78	74	74	80	85	80	72	59	84	87.1	86.5	86.5	99.8	86.5	In shop
5	76	78	79	78	84	79	69	57	46	83	83.5	84.5	84.5	97.7	84.5	In shop
6	74	78	76	78	84	77	68	54	44	82	82.9	83	83	95.7	83	In shop - lunchroom end (Exit)
7a	76.5	69	71	70	72	68.5	61.5	52.5	45	72	72.7	74.8	74.8	91.4	75.3	Lunch room - door open
7b	74	67	68.5	70	71.5	68.5	61	52	44	72.5	72.4	75.5	75.5	89	74.5	Lunch room - door closed
8	90	86	86	89	88	89	82	73	68	90	91.6	94.5	94.5	107.8	94.5	38' Ø fan outlet
9	85	81	84	89	90	86	77	67	59	90	90.3	89	89	102.5	90	38' Ø fan inlet

Note: The estimated dBA was calculated from frequency measurements.
Agreement between measured and estimated values should be ± 1dB.

83 dBA to 86 dBA. The peak noise level varied from 95 to 98 dBA. In the lunch room, measurements taken during coffee break showed noise levels to be lower, between 72 and 85 dB. Both measurements (door open and door closed) have approximately the same result, (measurements 7a and 7b, Table 1, Appendix A). The reason for poor attenuation is very large leakage between the wall and the ceiling and no acoustical insulation.

At the 38 inch, 15 H.P. Woods fan located above the ventilation door noise measurements were taken at the fan inlet and outlet. The difference between these two measurements in the octave band analysis is approximately 1.3 dB. For measurements of L_{eq} and slow and fast response the differences are about 5 dB. Data for all measurement results are found in Table 1.

All measurements taken in the garage and lunch room are below 90 dB and therefore conform to Ontario noise regulations. Regardless, attempts should be made to decrease this noise. Suggested methods of noise abatement include the installation of acoustical curtains on the shop ceiling near the fan inlet and the installation of elbows in the existing ductwork. If this is done, it is expected that the noise level can be lowered by 7 to 10 dB. Estimation of attenuation in this case should be done with the evaluation of the sound power level. Attention should be given to high air flow velocities. Also, good engineering practice to further reduce noise would be to locate fans as far as possible from areas in which employees must remain for any extended length of time (i.e., garage).

NOISE MEASUREMENTS AT STRATHCONA MINE

The ventilation department requested a short noise measurement on the 2375 level in the 23-24-C7 West Drift at fan numbers 10, 32 and 22 (Appendix B).

At present, this area is more a travelway than a place of work. The same techniques and procedures for noise measurement were followed in this area

as were followed in the 34 level diesel garage at Fraser Mine.

From Table 2, it can be seen that the noise level around all three fans is approximately the same. Only measurement No. 1 (75 ft or 3 m from measurement No. 2) ahead of fan No. 33 has a noise level of 96 dB which is approximately 6 dB lower than the average noise level in this area. Engineering solutions to reduce this noise are very expensive and impractical. Ideally then, it is best to avoid this area if possible. Alternatively, it is suggested that proper hearing protection be worn in this area regardless of exposure duration for the benefit of working comfort and to prevent loss of hearing.

CONCLUSIONS

A short noise study at Fraser Mine in the 34 level diesel garage indicated that noise levels conform to Ontario regulations but are still relatively high for overall workplace comfort. Engineering methods to attenuate noise include relocation of the fan as far as possible from garage, installing acoustical curtains on the shop ceiling near the fan inlet and the installation of elbows in the existing ductwork. These methods can lower the noise level by 10 to 15 dB.

At Strathcona Mine, noise measurements in the 2375 level, 23-24-C7 West Drift show relatively high levels (approx. 102 dB). Technical solutions to cut this noise are very expensive and impractical. As a result proper hearing protection should be worn regardless of exposure duration.

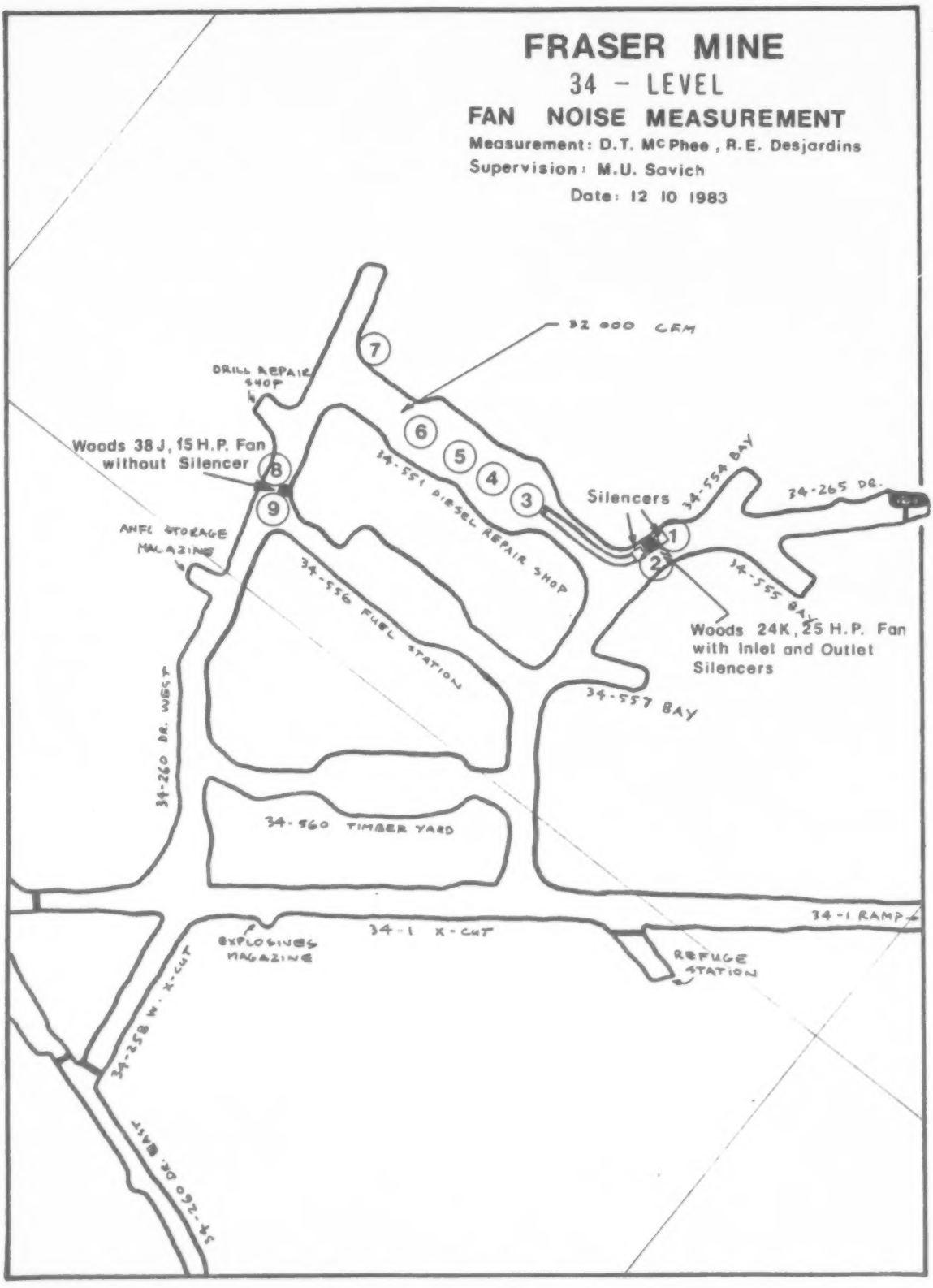
ACKNOWLEDGEMENTS

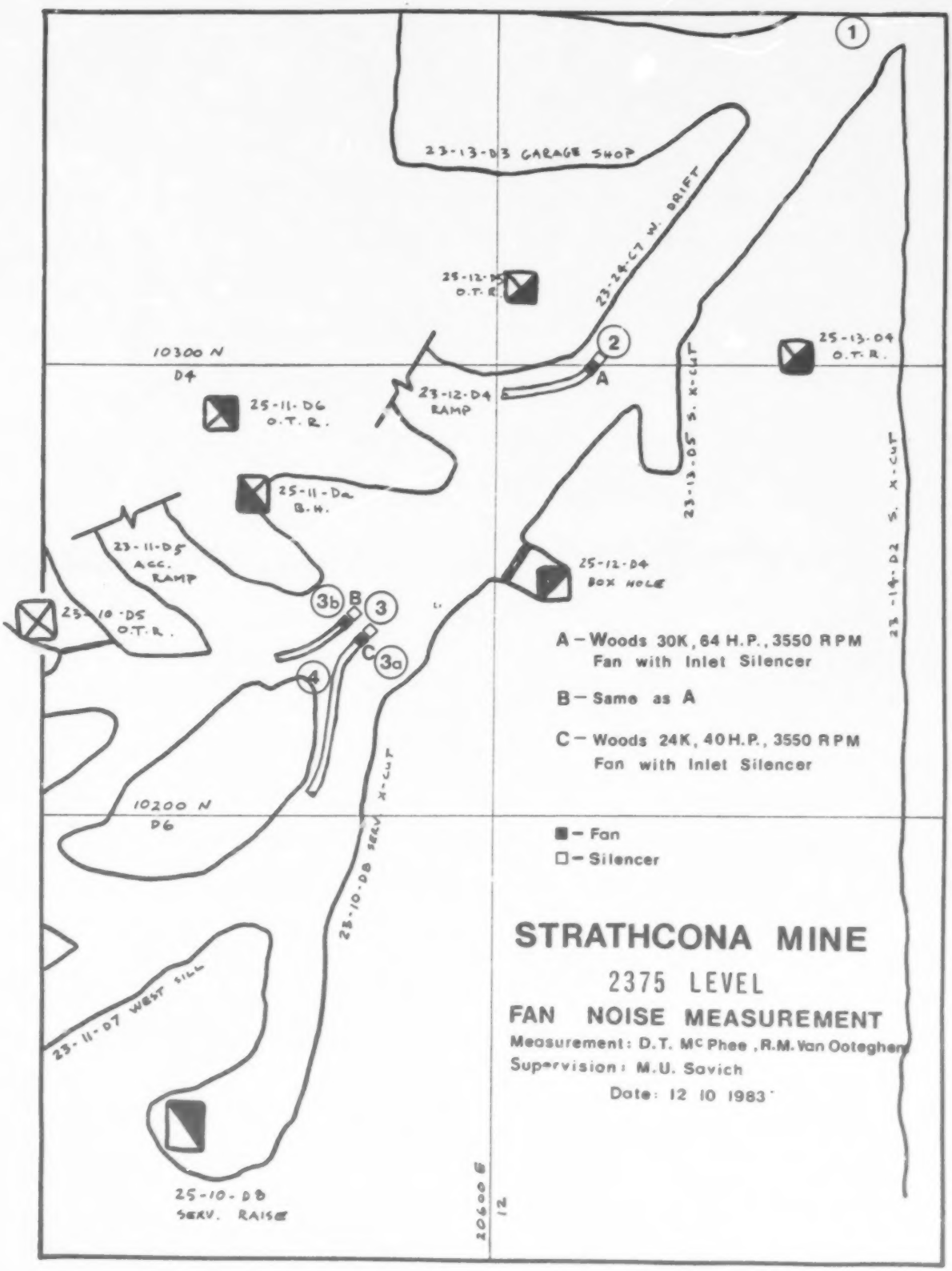
The authors wish to express their gratitude to Roy Rutland, Senior Ventilation Supervisor, Onaping Area and to Jim Calvert, Master Mechanic, Strathcona Mine for their assistance and cooperation.

Table 2 - Noise survey at 23-24-C7 West Drift, Strathcona Mine, Fan measurements 10 + 32 + 33.

Location	Frequency (Hz)									dBA						Comments
	31.5	63	125	250	500	1k	2k	4k	8k	Meas'd	Est'd	SPL(slow)	SPL(fast)	Peak	Leq	
1	85	89	88	89	94	92	88.5	82	72.5	96	96.1	96.5	96.0	108.5	96.5	See sketch
2	91	90	93	94.5	100	99	95	88.5	81.5	102	102.6	103.7	103.7	117.7	103.7	" "
3	85	92	93	96	101	99	93	86	79	102	102.5	103.5	103.5	116.5	103.5	" "
3a												103.0	103.5	116.5	103.5	" "
3b												102.5	102.5	115.5	103.0	" "
4	87	90	91	94.5	100	99	93	84	74	102	102.1					

Location of Measurements:
Intake fans - 2375' Level, Zone #7 - Development West.


FRASER MINE
34 - LEVEL
FAN NOISE MEASUREMENT
Measurement: D.T. Mc Phee , R.E. Desjardins
Supervision: M.U. Savich
Date: 12 10 1983
82 000 CFM
DRILL REPAIR SHOP
Woods 38 J, 15 H.P. Fan without Silencer
34-551 DIESEL REPAIR SHOP
Silencers
34-554 BAY
34-265 DR.
ANFO STORAGE MAGAZINE
34-556 FUEL STATION
34-555 BAY
Woods 24K, 25 H.P. Fan with Inlet and Outlet Silencers
34-557 BAY
34-260 DR. WEST
34-560 TIMBER YARD
34-1 RAMP
34-1 X-CUT
EXPLOSIVES MAGAZINE
REFUGE STATION
34-258 W. X-CUT
34-260 DR. EAST


23-13-D3 GARAGE SHOP
23-24-C7 W. DRIFT
25-12-D5 O.T.R.
10300 N
D4
25-11-D6 O.T.R.
23-12-D4 RAMP
25-11-D8 B.H.
23-11-D5 ACC. RAMP
25-10-D5 O.T.R.
25-13-D4 O.T.R.
23-13-D5 S. X-CUT
23-14-D2 S. X-CUT
25-12-D4 BOX HOLE
A – Woods 30K, 64 H.P., 3550 RPM Fan with Inlet Silencer
B – Same as A
C – Woods 24K, 40H.P., 3550 RPM Fan with Inlet Silencer
10200 N
D6
■ – Fan
□ – Silencer
23-10-D8 SERV. X-CUT
STRATHCONA MINE
2375 LEVEL
FAN NOISE MEASUREMENT
Measurement: D.T. Mc Phee, R.M. Van Ooteghem
Supervision: M.U. Savich
Date: 12 10 1983
23-11-D7 WEST SILL
25-10-D8 SERV. RAISE
20600 E
12

84-83 M. U. Savich and D. O'Connor

Measurement of impulse noises of vehicles at the Stanleigh Uranium Mine in Elliot Lake

1984

MEASUREMENT OF IMPULSE NOISE OF VEHICLES AT THE STANLEIGH URANIUM MINE IN ELLIOT LAKE

by

M.U. Savich* and D. O'Connor**

ABSTRACT

Measurements and evaluations for determining 'Peak' levels of short duration and the impulse noise of vehicles were done for the following engine states: wide open throttle (W.O.T.), IDLE, and under the working conditions of moving up a slope (UP) and down a slope (DOWN).

The mean value of all measurements performed is about 11 dBA. Industrial impulse noise contains a significant amount of energy in the 4-6 kHz range, which is also the region in which hearing loss usually first occurs. This frequency range, according to one group of authors, should be measured separately and taken into account when evaluating the noise exposure index (NEI). Another group of authors rejects this view and advances the view that for steady, intermittent and varying noise, including impulse noise, we need have only one scientifically acceptable basis for the measurement of noise exposure: 'integrated squared A-weighted sound pressure' with a determined integration period (ISO/R 1999-1984).

Measuring in detail the magnitudes of impulse noise, time durations and the number of impulses per shift, and then making a comparative analysis using audiometric tests, will show us the extent of this problem in Canadian mines.

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MESURE DES VIBRATIONS SONORES PRODUITES PAR DES VÉHICULES À LA MINE D'URANIUM STANLEIGH D'ELLIOT LAKE

par

M.U. Savich* et D.O. O'Connor**

RÉSUMÉ

On a pris des mesures et fait des évaluations visant à déterminer les niveaux maximaux d'intensité sonore de courte durée et des vibrations sonores produites par des véhicules en faisant tourner un moteur au régime suivant: à pleine charge (WOT), à charge au ralenti et en situation de service, soit en montant une pente (UP) ou en descendant une pente (DOWN).

On a établi la valeur moyenne de toutes les mesures du bruit à environ 11 dBA. Les vibrations sonores provenant des machines recèlent une quantité importante d'énergie dans la gamme des fréquences 4 à 6 kHz qui est aussi la zone de modulations qui provoque habituellement la surdité. Selon un groupe d'auteurs, cette gamme de fréquences devrait être mesurée séparément et on devrait en tenir compte lorsque l'on fait l'évaluation de l'indice d'exposition au bruit (IEB). Un autre groupe rejette cette opinion et soutient que les bruits réguliers, intermittents ou variés y compris les vibrations sonores peuvent être mesurés à l'aide d'une mesure de l'exposition au bruit scientifiquement acceptable soit la 'mesure du niveau acoustique global pondéré A au carré' au cours d'une période déterminée (ISO/R 1999-1984).

La mesure du détail de l'ampleur des vibrations sonores, de la durée et du nombre d'impulsions par quart de travail et enfin l'analyse comparative au moyen de tests audiométriques démontrera l'envergure de ce problème dans les mines canadiennes.

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CONTENTS

	Page
ABSTRACT	i
RÉSUMÉ	ii
INTRODUCTION	1
EXPOSURE TO NOISE	1
INSTRUMENT	5
MOBILE EQUIPMENT IN MINE	5
MEASUREMENT RESULTS	7
DISCUSSION OF RESULTS	12
CONCLUSION	16
ACKNOWLEDGEMENTS	17
REFERENCES	18
APPENDIX A	A-19
APPENDIX B	B-24

FIGURES

No.		
1.	Isometric view of the Stanleigh uranium mine	2
2.	Graph of differences between the sound pressure level in dBA and the peak value for all vehicles at the W.O.T. state of the engine at Stanleigh Mine	8
3.	Graph of differences between the sound pressure level in dBA and the peak value for some vehicles at an idle state of the engine at Stanleigh Mine	10
4.	Graph of differences between the sound pressure level in dBA and the peak value for some vehicles moving up a slope at Stanleigh Mine	11
5.	Graph of differences between the sound pressure level in dBA and the peak value for some vehicles moving down a slope at Stanleigh Mine	13

TABLE

1.	The difference between the peak value and dBA value	14

INTRODUCTION

The Stanleigh uranium mine in Elliot Lake was opened for large scale production of ore in 1983, using a very modern process. It has five spiral levels, which facilitate the moving of equipment from one level to another (Fig. 1) (Appendix A 1-5). The spiral levels are themselves the reason why measurements were taken at the mine, because they provide a unique opportunity to test loaded and unloaded vehicles when moving up or down slopes to change levels.

The purpose of these measurements was to find differences between sound pressure levels in dBA and Peak levels (impulse or impact noise), and to find an explanation for the hearing loss at 4-6 kHz by vehicle operators in mines. Impulse or impact noise is defined as a sound which reaches peak intensity within a rise time of not more than 30 milliseconds and has a duration of not more than 500 milliseconds.

EXPOSURE TO NOISE

In exposure evaluations of steady and intermittent noise, two concepts have been predominant: the 'total energy theory' and the 'principle of equinocivity'. The 'total energy theory' is determined by the average noise - induced hearing loss within a representative population, or more simply by the total amount of A-weighted sound energy received by the ear. Noise exposure evaluations, where the rate at which damage accumulates is directly proportional to sound intensity, are carried out daily. This means that a 3 dB increase in the sound level corresponds to a halving of the exposure time. The 'principle of equinocivity' has a close relationship between the temporary

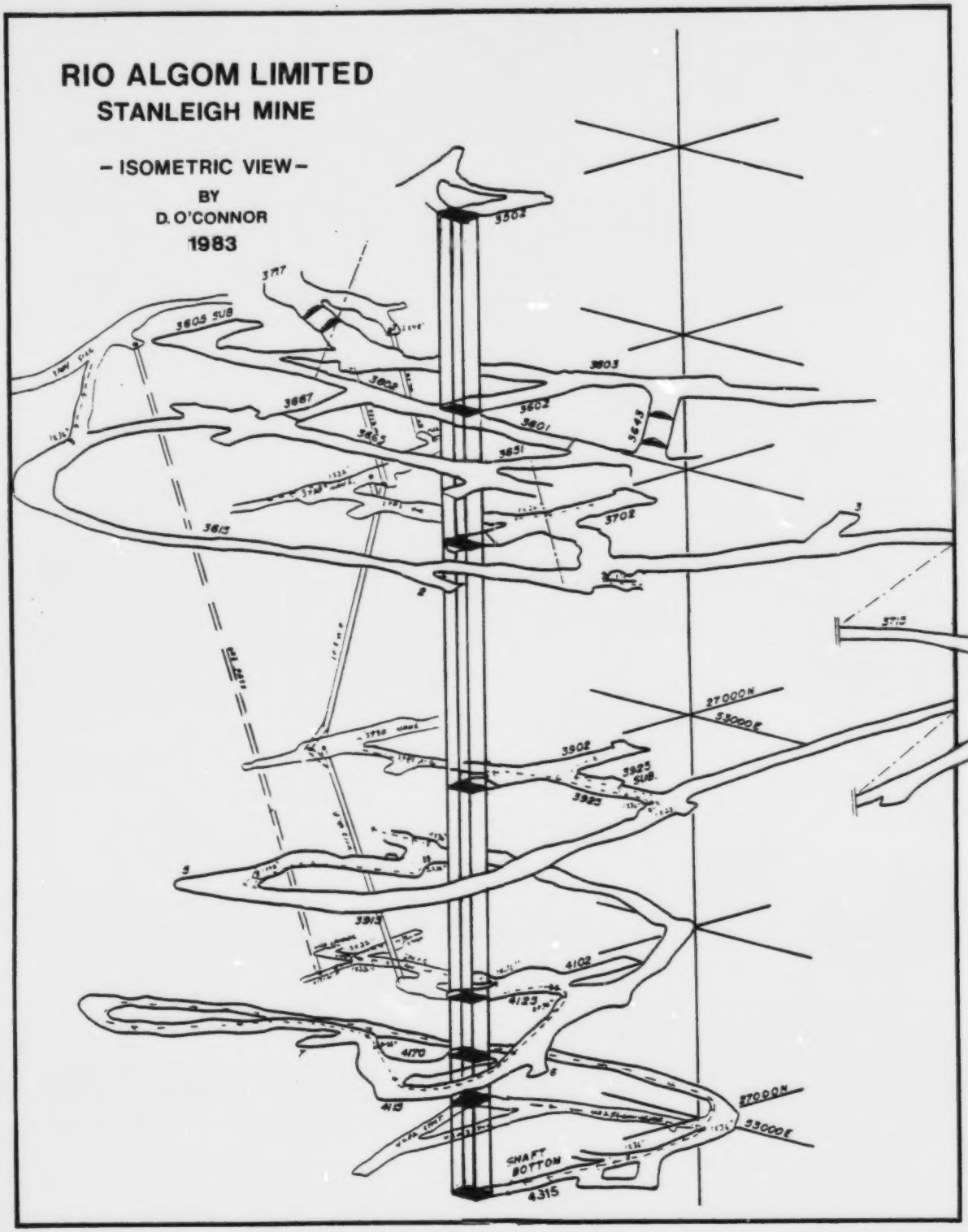


Fig. 1 - Isometric view of the Stanleigh uranium mine.

threshold shift (TTS) measured at the end of the working day and the permanent noise - induced threshold shift (PTS). The '5 dB rule' has been predominant in North American noise regulations in the last decade. In these regulations, a threefold increase in sound intensity, by the factor of $\sqrt{10}$, corresponds to a 5 dB increase in sound level, which is traded against a halving of daily noise duration. The total energy in the exposure is increased by a factor of 1.5 (i.e., 3 x 0.5). "Since the reduction in total duration could be brought about by appropriate intermittency, the 5 dB rule would, in such circumstances, be qualitatively consistent with TTS experiments and, by inference, with the 'principle of equinocivity'. There is, however no guarantee of intermittency since the 5 dB rule makes no distinction between interrupted and uninterrupted exposures"(1).

Measurements performed at the Denison Mine in Elliot Lake have shown that industrial noise there, was interrupted several times per day before lunch and several more times afterwards (2-4). Sometimes it happens that machines remain turned off before lunch and sometimes after. Such a phenomenon supports the 5 dB rule (5).

A broad discussion is still taking place on whether to introduce the 3 dB rule (ISO), or retain the old 5 dB one (OSHA). Literature on this topic will not be cited because it is beyond the scope of this report. Scientific support has for the most part been behind the new ISO document entitled "Determination of Occupational Exposure and Estimation of Noise - Induced Hearing Loss" (ISO, 1984); and the document received approval in February 1984 for publication as a new edition of ISO 1999. The definition of 'time-integral of the squared A-weighted sound pressure' is equivalent to the 3 dB trading relationship. It should be noted that the following sentence shows the comprehensive relationship among different types of noise:

intermittent, fluctuating, irregular or impulsive in character: Use of this International Standard for instantaneous sound pressures exceeding 200 Pa (140 dB relative to 20 Pa) and for higher sound pressure levels should be regarded as extrapolation."

The method presented in ISO/DIS 1999-1984 is based on a measurement of the 'time integral of the squared A-weighted sound pressure' for a longer period, for example, a working week. At the Fourth International Congress on Noise as a Public Health Problem held in Turin, Italy in June 1983, the workshop Memorandum recognized that 'impulsiveness' requires 'characterization in relation to its biological significance' (1). At this meeting there was a clear statement that a minimum of five years of research would be needed before the method of ISO/DIS 1999-1984 could be improved upon.

The importance of this problem will be explained briefly. For more than forty years it has been known that hearing loss starts in the 4-6 khz range (C_5-dip), despite the fact that industrial noise has a higher intensity in the frequency range of 250-500 Hz than in the 4-6 khz range. "There has been considerable speculation as to why hearing loss due to industsrial noise occurs 3 octaves higher on the frequency scale than the corresponding frequency region with the most energy content, and no sensible explanation has been given to date." (6).

In 1976, P.V. Bruel explained why hearing loss always starts around 4-6 kHz and also why the risk of hearing loss is considerably higher in this case than that given by the total noise dose criterion. In his practical examples and measurements he showed that risk criteria must take into consideration the total noise dose as well as the impulsive content of the noise.

Many authors are opposed to the above mentioned view of P. Bruel, and

they may very well be right in certain cases or jobs. To assess these opposing views we undertook to perform approximate measurements; measuring only the 'peak' and not its duration or number of impulses. Measuring the last two would have required more sophisticated instruments and the concomitant investment.

INSTRUMENT

All measurements were taken using the Bruel and Kjaer Integrating Sound Level Meter Type 2225. The 2225 was designed to assess hearing and has a choice of four functions: 60s L_{eq}, Fast, Slow and Peak. The maximum peak value occurs before the instrument is reset. The PEAK function better than $\pm$ 0.1 dB/s uses a rise time of 30 µs, which is very important for assessing hearing damage risk.

The Sound Level Meter (SLM) was carried in an aluminum case (7). The case has a wide strap, allowing the SLM to be carried over a shoulder for easy 'hands-off' transportation . The Noise Survey Form was designed and produced in book form to be used with the aluminum case. The case was built at the Elliot Lake Laboratory.

MOBILE EQUIPMENT IN MINE

All mobile equipment should be classified under three categories:

- trucks
- tractors, and
- load-Haul-Dump (LHD) machines.

Noise sources of these machines are (8):

- engine airborne noise from the engine or block structure;
- engine structure-borne noise caused by engine vibrations

throughout the machine's structure;

- auxiliary-component noise from the transmission and hydraulic system;
- fan noise;
- exhaust noise;
- air intake noise from the intake and structural radiation from the intake piping.

At the component source levels, the highest levels are produced by engine and exhaust outlet noise.

Sound pressure level and Peak level were taken from vehicles on five levels of the mine. The largest number of measurements were taken at the 3500 and 3600 levels (Appendix A 1-2). One factor for tests to be successful was to retain an underground mining environment and its reverberation. Rerverberation time, T, is defined as the time required for the sound to decay 60 dB. Absorption properties of stones and concrete vary with frequency, as does reverberation time.

Usually, reverberation time is calculated for the single frequency of 500 Hz. Reverberation time depends upon tunnel dimensions and the total absorption of the room:

$$T = 0.161(\frac{V}{A})s$$

where, T = reverberation time (s)

V = volume of the space (m^3)

A = total absorption of the space (metric sabins).

The larger the tunnel or underground area, the greater will be reverberation time. Another factor in successfully completing the tests was to perform measurements on as many types of vehicles as possible without interfering in the continual operations of the mine. In plans of levels 3500,

3600, 3700, 3900 and 4100, places where measurements were taken ('test location') are numbered so as to correspond to numbers in Appendix B 1-5.

MEASUREMENT RESULTS

Seventy-six measurements were carried out on 15 types of vehicles:

Engine states (Appendix B 1-4):

- W.O.T. (21) } Measurement taken at operator's ear
- IDLE (17) }

Working condition (Appendix B 1-3 and 5):

- UP (up a slope) (19) } Measurement taken beside moving vehicle
- DOWN (down a slope) (19) } for approximately 1 m

Where more measurements were taken on the same type of vehicle, it is so noted in the columns, "No. of Vehicles". For example, in Appendix B-4, No. 10; Appendix A 1 and 2 have three vehicles. Mean values have been found where many measurements were taken. Measurement results are tabled in Appendix B 1-5. Differences between equivalent levels and sound pressure levels are from 0 to 2 dBA, but for our purpose of cursorily investigating the problem, this does not make for great errors. Errors which occurred during measuring have for the most part been equalized.

W.O.T

Figure 2 gives the results for the W.O.T. state of the engine, where the mean was calculated to be 12.11 dBA and the standard deviation 1.92 dBA. The largest difference between the sound pressure level in dBA and the peak value was with the No. 4 tractor (34 hp), a difference of 16 dBA; and the smallest difference was with the telescope dump truck (231 hp), a difference of 6.5 dBA. This proves the maxim that the more powerful motor does not necessarily have to be louder, because the larger mass can successfully dampen

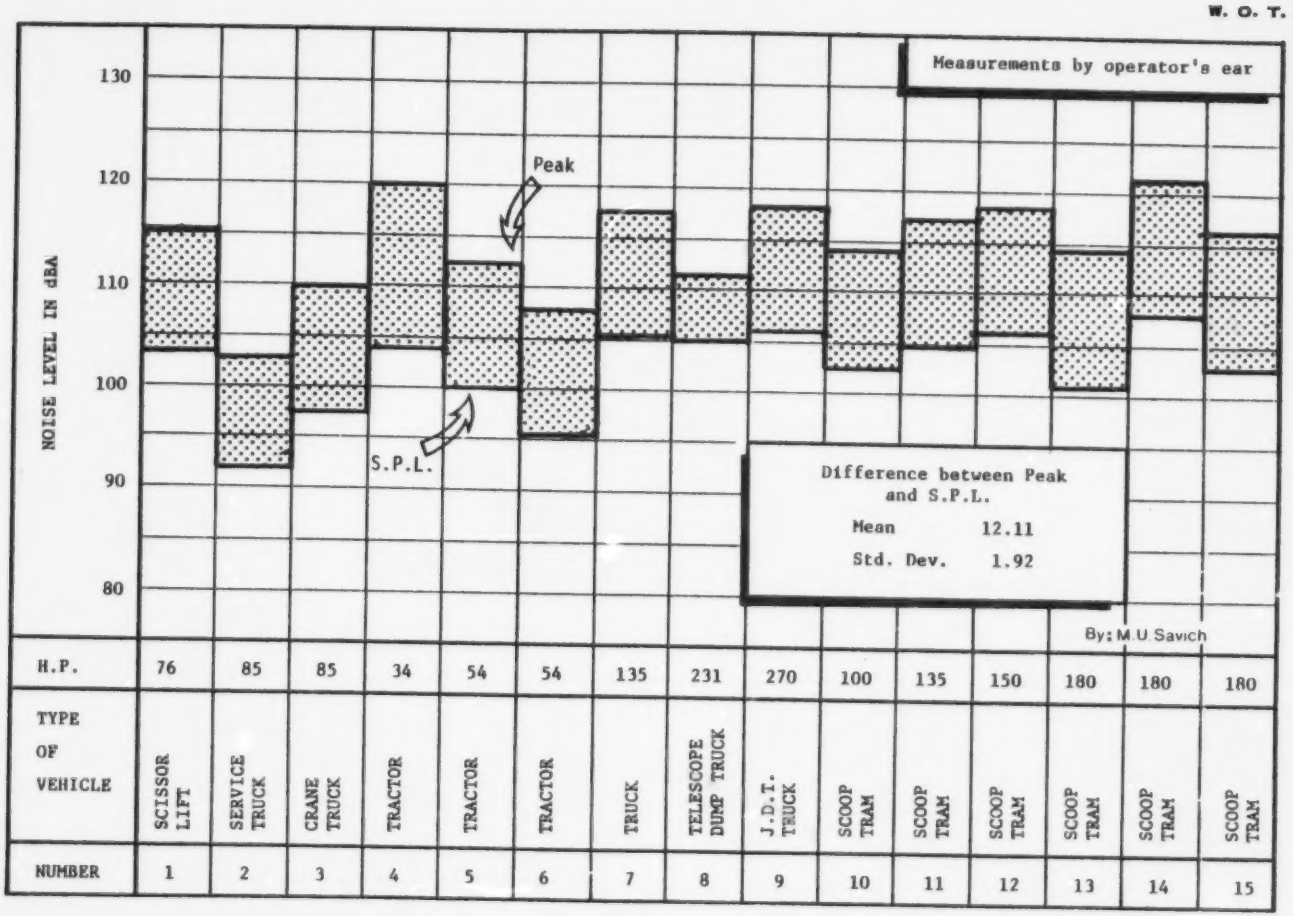

W. O. T.
Measurements by operator's ear
NOISE LEVEL IN dBA
130
120
110
100
90
80
Peak
S.P.L.
Difference between Peak and S.P.L.
Mean 12.11
Std. Dev. 1.92
By: M.U.Savich
H.P. 76 85 85 34 54 54 135 231 270 100 135 150 180 180 180
TYPE OF VEHICLE SCISSOR LIFT | SERVICE TRUCK | CRANE TRUCK | TRACTOR | TRACTOR | TRACTOR | TRUCK | TELESCOPE DUMP TRUCK | J.D.T. TRUCK | SCOOP TRAM | SCOOP TRAM | SCOOP TRAM | SCOOP TRAM | SCOOP TRAM | SCOOP TRAM
NUMBER 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Fig. 2 - Graph of differences between the sound pressure level in dBA and the peak value for all vehicles at the W.O.T. state of the engine at Stanleigh Mine.

noise and vibration. All other results are almost equal to one another, with small variation.

IDLE

Figure 3 gives the results for the IDLE state of the engine. Here the mean was calculated to be 11.61 dBA with a standard deviation of 2.16 dBA. Scooptram No. 10 yields a very small difference between SPL and Peak level, for a reason which has not been determined. The difference should be 5 to 6 dB greater than it is. Nevertheless, because of reasons mentioned earlier, this result was not discarded. For the most part, all other results are similar and vary from 10.7 dBA to 13.9 dBA.

UP

Figure 4 shows the results for vehicles moving up a slope with a surveyor measuring noise from 1 m beside the moving vehicle. Here results can be divided into two groups:

1) 7.3 dBA to 10.4 dBA - 7 samples
2) 10.5 dBA to 13.9 dBA - 5 samples

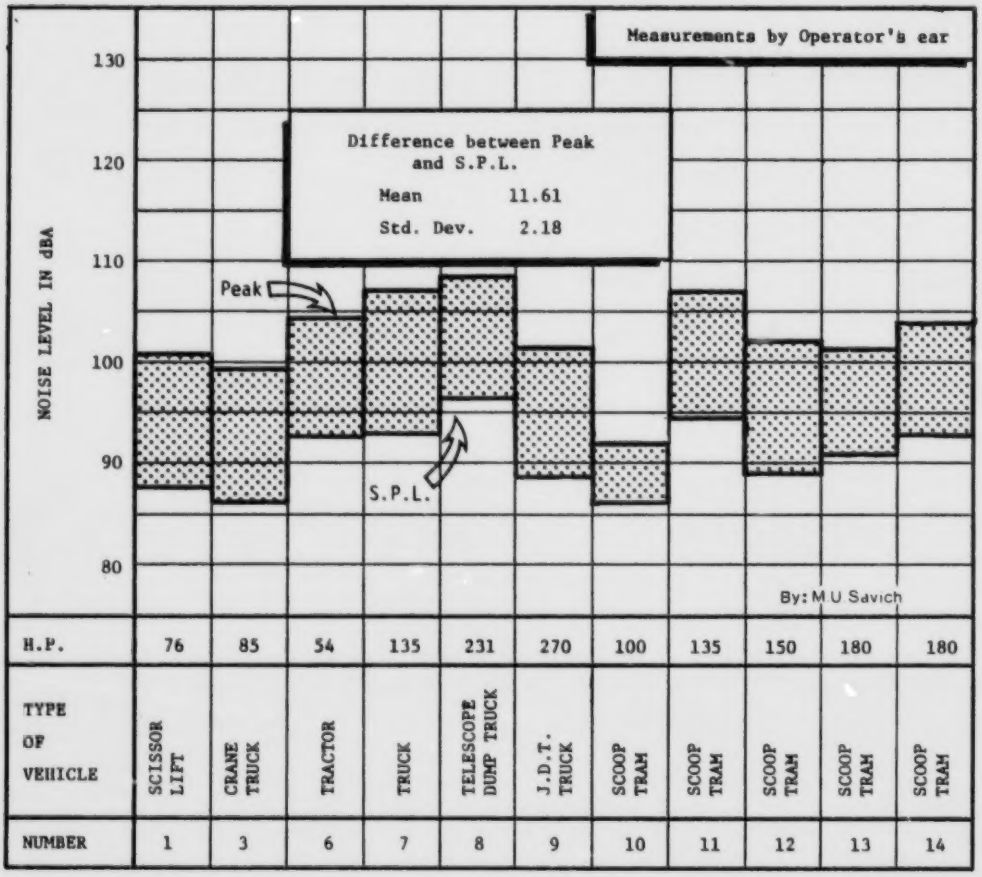
Total 12 samples

These two groups are the result of variations in the following:

- distance between microphone and vehicle (surveyor's position)
- vehicle load
- vehicle position (left or right side)
- maintenance, and
- vehicle asymmetry.

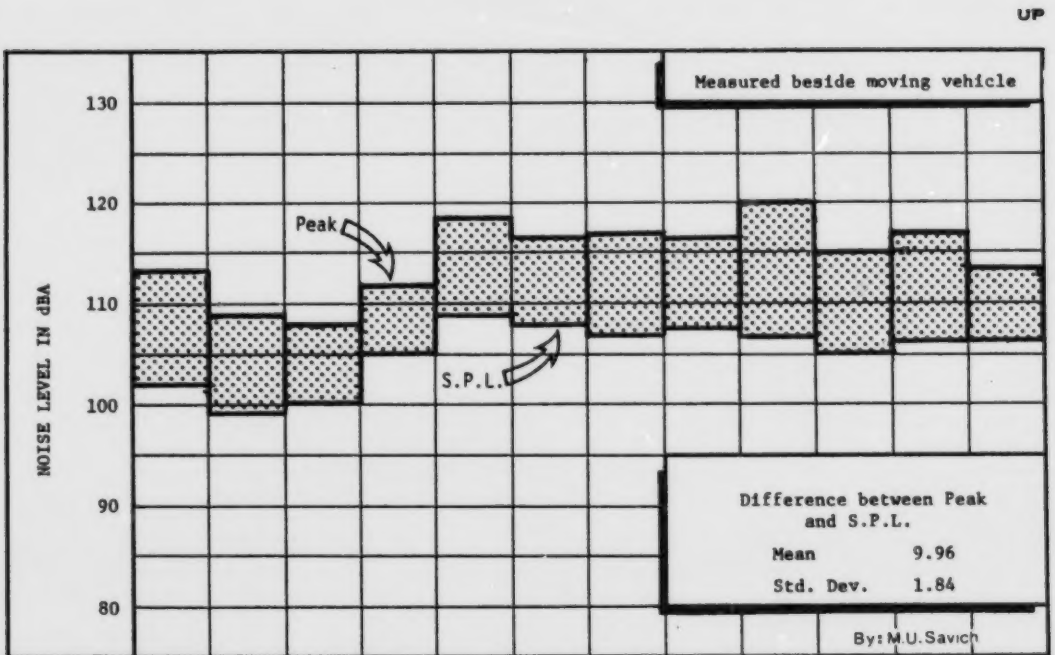
After calculations, the mean and standard deviation are 9.96 dBA and 1.84 dBA, respectively. The largest difference between SPL and Peak level is 13.9 dBA yielded by No. 11 scooptram (155 hp). Each result would have to be discussed separately. Only a large number of measurements and a detailed study of vehicles could correct and explain these results.

IDLE



H.P.	76	85	54	135	231	270	100	135	150	180	180
TYPE OF VEHICLE	SCISSOR LIFT	CRANE TRUCK	TRACTOR	TRUCK	TELESCOPE DUMP TRUCK	J.D.T. TRUCK	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM
NUMBER	1	3	6	7	8	9	10	11	12	13	14

Fig. 3 - Graph of differences between the sound pressure level in dBA and the peak value for some vehicles at an idle state of the engine at Stanleigh Mine.



H.P.	85	85	34	54	135	231	270	100	135	150	180	180
TYPE OF VEHICLE	SERVICE TRUCK	CRANE TRUCK	TRACTOR	TRACTOR	TRUCK	TELESCOPE DUMP TRUCK	J.D.T. TRUCK	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM
NUMBER	2	3	4	6	7	8	9	10	11	12	14	15

Fig. 4 - Graph of differences between the sound pressure level in dBA and the peak value for some vehicles moving up a slope at Stanleigh Mine.

DOWN

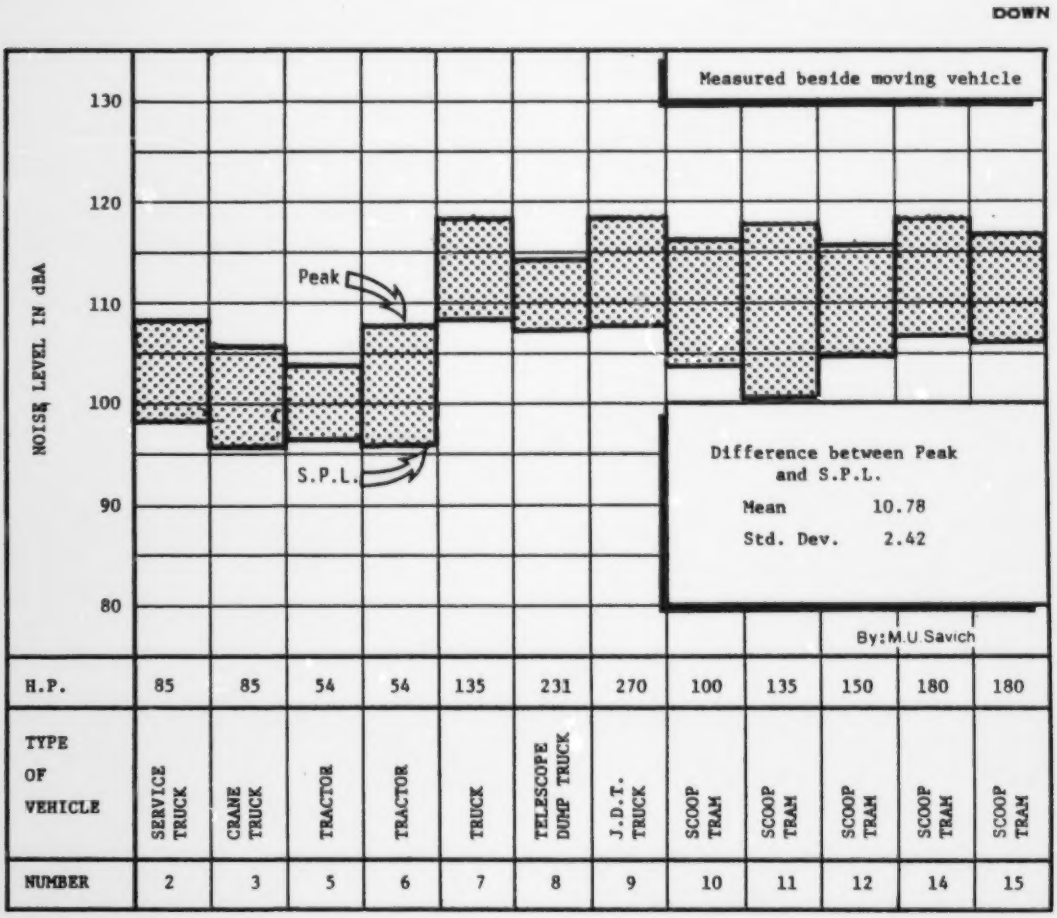
In Fig. 5 results are shown for vehicles moving down a slope while the surveyor is positioned 1 m away from their sides. Here the mean comes out to be 10.78 dBA with a standard deviation of 2.42 dBA. In this case, as well, differences in results are perceptible. Reasons and causes for this are the same as those of the 'upward slope' case. The No. 11 scooptram (135 hp) again yields the largest difference between SPL and Peak, a difference of 16.9 dBA. Motor power of the No. 11 scooptram is considerably greater than that of the No. 10 scooptram (100 hp) and less than the No. 12 scooptram (150 hp), yet both No. 10 and No. 12 yield markedly smaller differences between SPL and Peak level. From this one can conclude that the No. 11 scooptram should be checked to see whether it needs maintenance. Throughout all tests, including this one, the No. 8 telescope dump truck consistently yielded the lowest difference, of 7.3 dBA.

DISCUSSION OF RESULTS

If we compare the final results of our measurements (namely, the differences between sound pressure levels and peaks), we can see that these results are similar in all cases:

	W.O.T.	IDLE	UP	DOWN
Mean	12.11	11.61	9.96	10.78
Std. Dev.	1.92	2.18	1.84	2.42

These results should most likely be lower by 1 to 2 dBA, because for this type of measurement, usually the mean is taken from 5 measurements (with 5 to 10 second intervals) for Impact Hold and Peak Hold, which in our case was impossible to do. By referring to Table 1 and finding the difference between the peak value and dBA value, the risk criteria for different types of noise,



H.P.	85	85	54	54	135	231	270	100	135	150	180	180
TYPE OF VEHICLE	SERVICE TRUCK	CRANE TRUCK	TRACTOR	TRACTOR	TRUCK	TELESCOPE DUMP TRUCK	J.D.T. TRUCK	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM	SCOOP TRAM
NUMBER	2	3	5	6	7	8	9	10	11	12	14	15

Fig. 5 - Graph of differences between the sound pressure level in dBA and the peak value for some vehicles moving down a slope at Stanleigh Mine.

Table 1 - The difference between the peak value and dBA value.

Sound Source	Fast dBA	Imp. dBA	Imp/Hold dBA 5x	Peak Hold dBA 5x	Δ
Motorway traffic 15 m distance	80	80	81	89	8
Motorway traffic 50 m distance	68	68	68	76	8
Noise in car Type Fiat 500, 60 km/h	78	79	79	93	14
Noise in car Type Volvo 142, 80 km/h	75	75	76	86	10
75 hp diesel motor in electricity generating plant	100	101	101	113	12

such as motorway, traffic, car interior and diesel motor noise can be found (6).

The results in Table 1 were obtained using a B & K Sound Level Meter Type 2209 with a 'Hold' circuit for peak voltage measurements, which with the A-filter coupled in, has an averaging time of 30 us for peak measurements. For our measurements we used a B & K Integrating Sound Level Meter Type 2225 with 'Slow' and 'Fast' time constants, and a 'Peak Hold' better than ± 01 db/s, with a 30 µs rise time.

The Type 2205 instrument and a new generation of similar instruments could be adapted successfully, in combination with level recorders, for this kind of measurment. The most interesting aspect in this connection is to find out how large the 'Peak' value is above dBA 'Fast' or dBA 'Impulse'. The larger this difference is, the more hazardous is the noise. However, this method of measurment requires additional expensive instruments and qualified surveyors. For small and mid-size mining operations these factors make the method practically unaffordable. Thus the reason for this project: facilitating the taking of four main measurements (W.O.T., IDLE, UP and DOWN) of vehicles, where measurment is usually most difficult, by using relatively inexpensive instruments. Furthermore, the project aims to ascertain whether, on the basis of these measurements, results can be standardized for mining machinery. Today, standardization is very important in laying down normative specifications from the point of view of internal requirements first of all. "However, in the actual process of standardization, more extensive technical interests have to be taken into account. Work standards and normative specifications dealing with a limited area - mining instruction sheets, for example - are to be recognized as a preliminary stage of standardization" (9).

In our work to measure the Noise Exposure Index (NEI) we use a

profiling dosimeter which can generate 480 results in 8 hours. Measurement results are closely related to the work and relationship of workers and machines. In other words, these results are a time study of each worker. If we could obtain systematized results in dBA of 'Impulse' and 'Peak' values of varying duration for each piece of equipment, and if we could pass this data through an existing computer program, we would end up with very valuable results.

In this way mining companies would not have to increase their budgets in order to hire for new positions and purchase expensive instruments. Only in exceptional circumstances would supplementary measurements have to be taken, and this in larger mines, where not everything can be measured and predicted.

CONCLUSION

The mining industry is obliged to cooperate in the establishment of safety regulations in noisy environments because these regulations demand constant check-up measurements, measurement simplification, and the assurance that results will not depreciate in value. To measure impulse or impact noise in underground areas it is best that measurements be carried out from one place, or failing that, in as few places as possible so as to have constant reverberation time. From this it follows that the results used will be accurate.

Measurements and evaluations for determining peak levels of short duration of vehicle noises were carried out for the following engine states: Wide Open Throttle (W.O.T.), IDLE, and under the working conditions of moving up a slope (UP), and down a slope (DOWN). The mean value of these measurements is about 11 dBA. Some authors treat impulse noise as a serious

health hazard. Hearing loss always starts in the 4-6 kHz range because the peaks in industrial noise contain significant amounts of energy in this frequency region.

At the Fourth International Congress on Noise as a Public Health Problem held in Turin, Italy, in June 1983, the Workshop Memorandum recognized that 'Impulsiveness' requires 'characterization in relation to its biological significance'. A minimum of five years of research would be needed before the method of ISO/DIS 1999-1984 could be improved upon. With increasing scientific knowledge relating to effects of occupational noise exposures and aspects of noise measurement and control, a new ISO standard with new requirements should appear within 5 years. For this reason the Elliot Lake Laboratory has begun work on the above-mentioned problem, to enable Canada's mining industry to meet the new requirements if that becomes necessary.

This test has been the most difficult, because it required expensive, yet bulky, instruments, suitable natural conditions and a large number of different vehicles in one place. Tests on the ventilation system at Rio Algom are already complete (7). All other tests on mining machinery have also been completed, in the mines, mills and smelter at Falconbridge.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to Ian Montgomery, Ventilation Engineer, Rio Algom Ltd., Elliot Lake, for his approval to conduct this survey and for his interest in the project. The authors also acknowledge the assistance they received from A. Mannisto and W. Howard, the Ventilation Officers at Stanleigh, and D. Restoule, the Union Environment Monitor at Stanleigh. Also acknowledged is the support of the Elliot Lake Laboratory through M. Turcotte.

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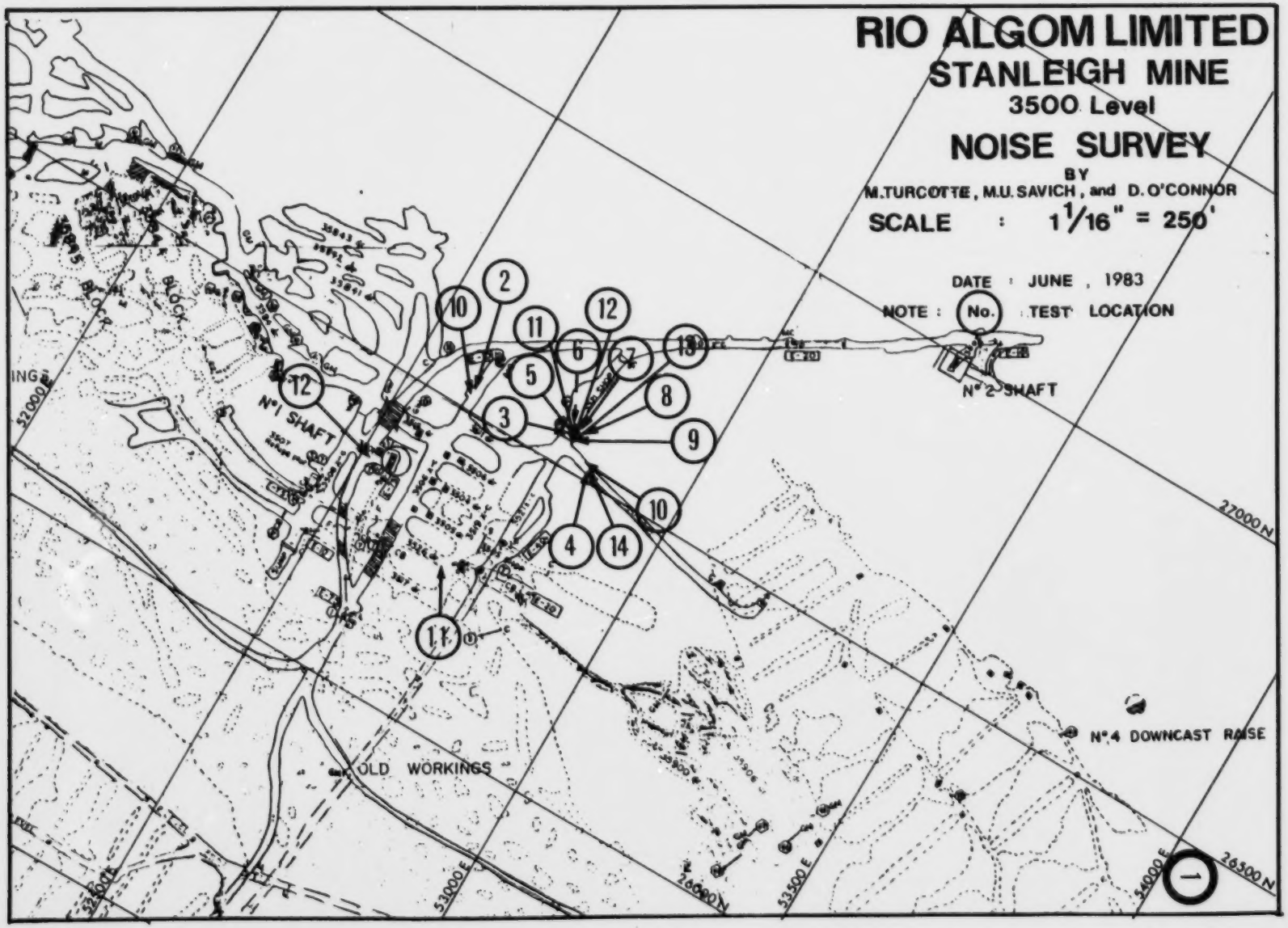
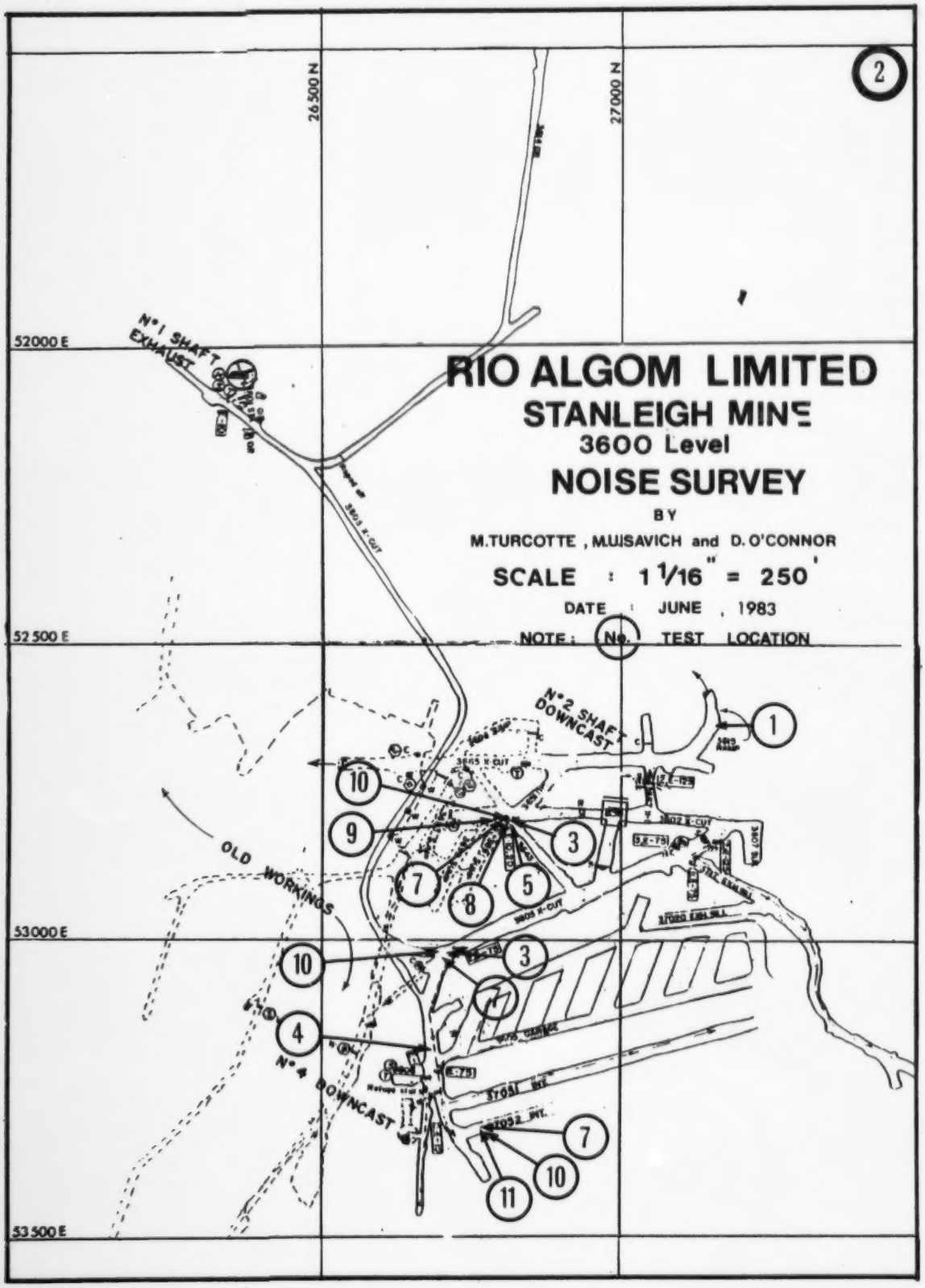
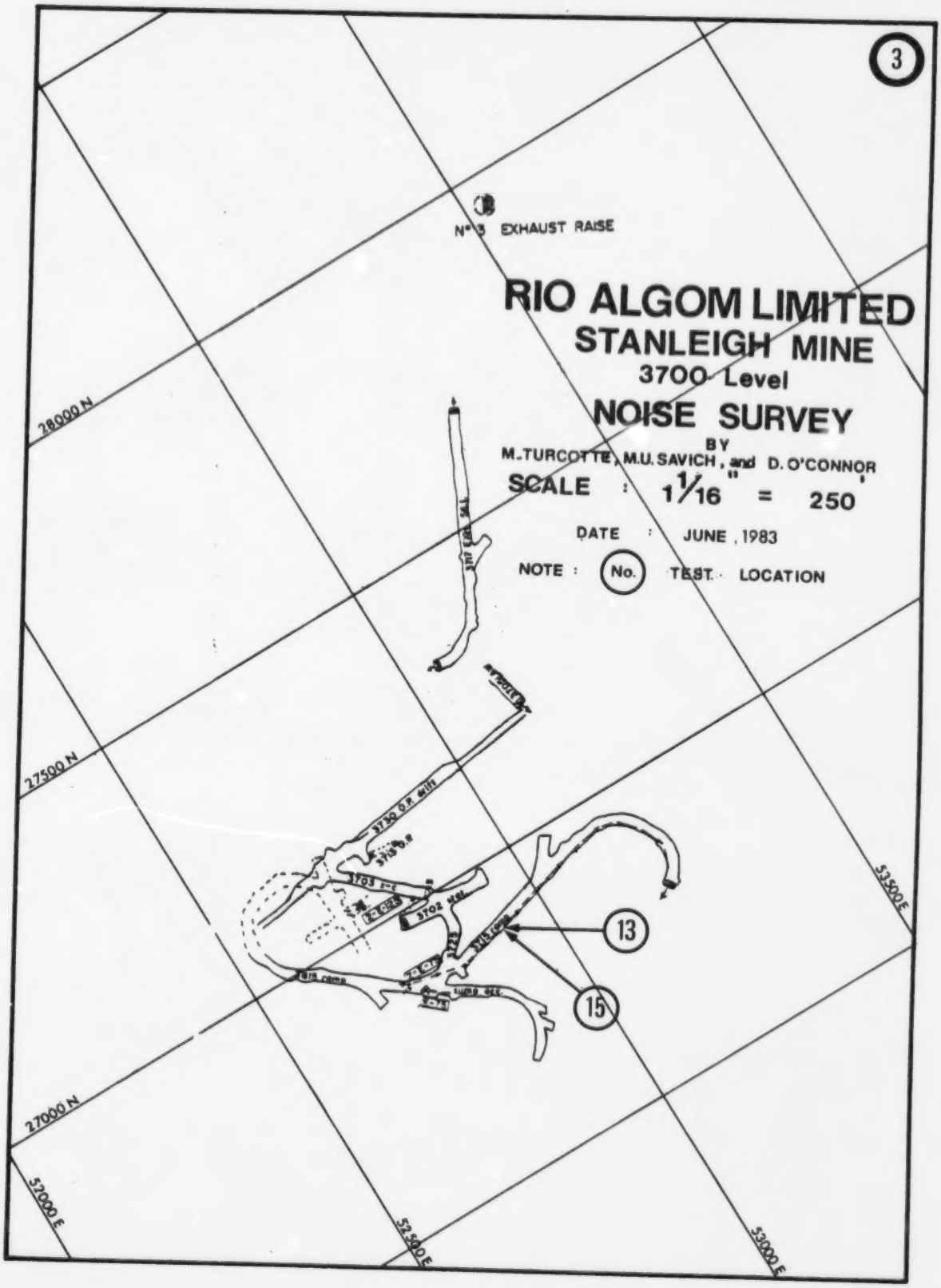
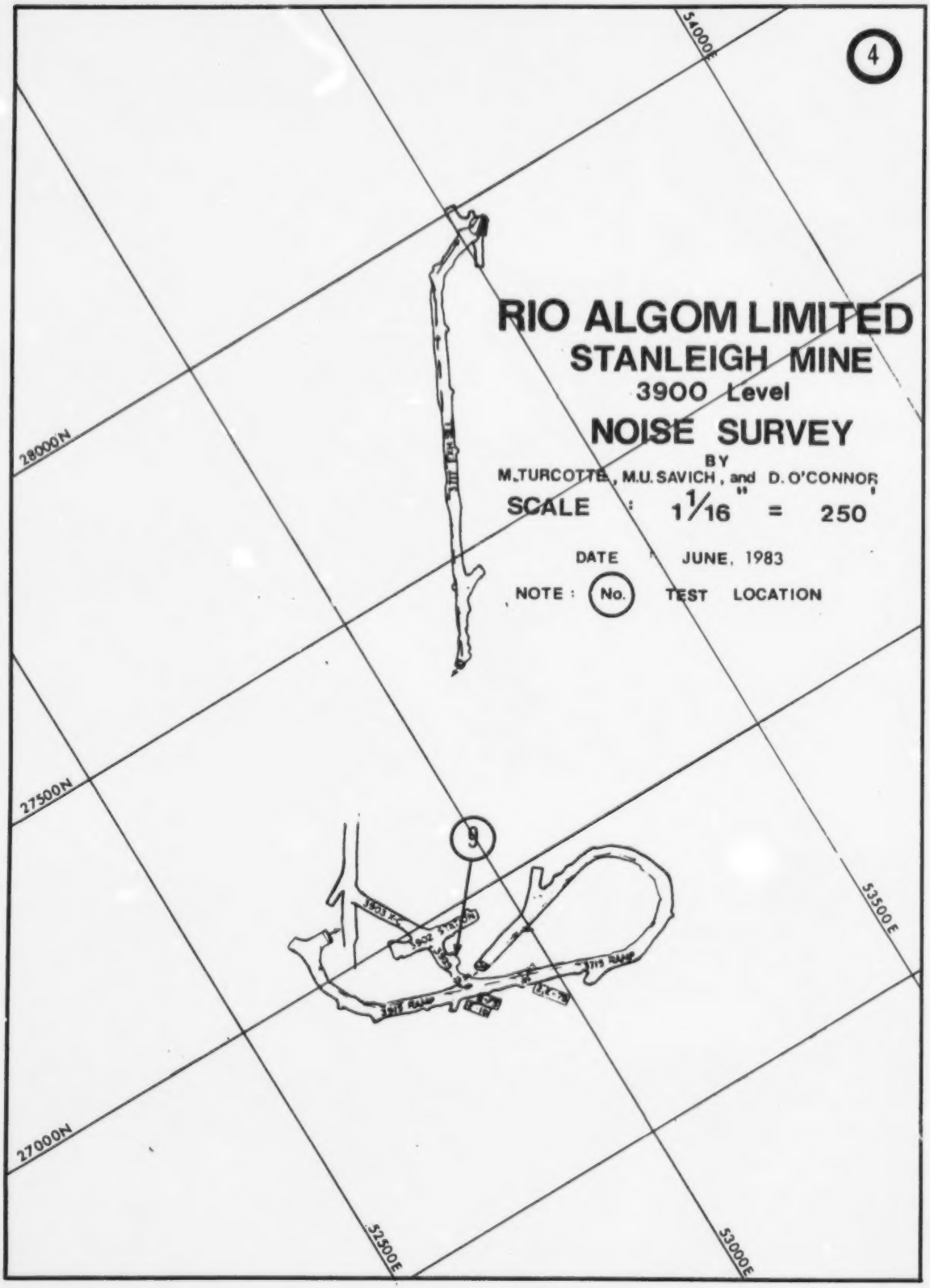

RIO ALGOM LIMITED
STANLEIGH MINE
3500 Level
NOISE SURVEY
BY
M.TURCOTTE, M.U.SAVICH, and D.O'CONNOR
SCALE : 1 1/16" = 250'
DATE : JUNE , 1983
NOTE : (No.) : TEST LOCATION
N° 2 SHAFT
N° 1 SHAFT
OLD WORKINGS
N° 4 DOWNCAST RAISE
27000N
26900N
26300N
53000E
53500E
54000E
BLOCK


26500 N
27000 N
52000 E
52500 E
53000 E
53500 E
N°1 SHAFT EXHAUST
N°2 SHAFT DOWNCAST
N°4 DOWNCAST
OLD WORKINGS
RIO ALGOM LIMITED
STANLEIGH MINE
3600 Level
NOISE SURVEY
BY
M.TURCOTTE , M.UISAVICH and D. O'CONNOR
SCALE : 1 1/16" = 250'
DATE : JUNE , 1983
NOTE : (No.) TEST LOCATION


3
N°3 EXHAUST RAISE
RIO ALGOM LIMITED
STANLEIGH MINE
3700 Level
NOISE SURVEY
BY
M. TURCOTTE, M.U. SAVICH, and D. O'CONNOR
SCALE : 1 1/16" = 250'
DATE : JUNE, 1983
NOTE : (No.) TEST LOCATION
28000 N
27500 N
27000 N
52000 E
52500 E
53000 E
53500 E
13
15


4
54000E
28000N
27500N
27000N
52500E
53000E
53500E
RIO ALGOM LIMITED
STANLEIGH MINE
3900 Level
NOISE SURVEY
BY
M.TURCOTTE, M.U.SAVICH, and D.O'CONNOR
SCALE : 1 1/16" = 250'
DATE : JUNE, 1983
NOTE : (No.) TEST LOCATION
9

5

RIO ALGOM LIMITED

STANLEIGH MINE

4100 Level

NOISE SURVEY

BY

M. TURCOTTE, M.U. SAVICH and D. O'CONNOR

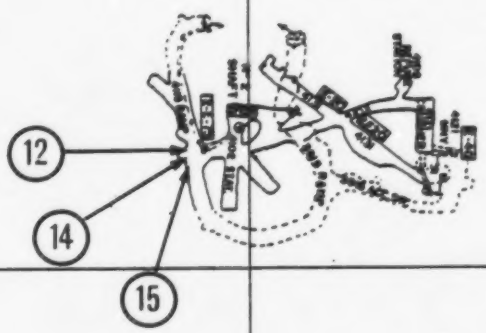
SCALE : 1 1/16" = 250'

DATE : JUNE , 1983

NOTE : (No.) TEST LOCATION

53000 E

52500E



53000E

53500 E

27500 N

27000N

26500 N

Measurement Results

Engine states: **W.O.T.-IDLE**

Number	Appendix A	No. of Vehicles	VEHICLE INFORMATION			NOISE LEVEL IN dBA	80	85	90	95	100	105	110	115	120
			Type	Factory	h.p.										
1	2	1	Scissor lift	Jarvis Clark	76	W.O.T.	XXXXXXXXXXXXXXXXXXXXXXXXXXXX + S.P.L.								
							000000000000000000000000000000000000000000000000 - Peak								
						IDLE	XXXXXXXXX - S.P.L.								
							000000000000000000000000 - Peak								
2	1	1	Service truck	Teledyne	85	W.O.T.	XXXXXXXXXXXXXX - S.P.L.								
							000000000000000000000000000 + Peak								
						IDLE									
3	1 2	3	Crane truck	Teledyne	85	W.O.T.	XXXXXXXXXXXXXXXXXXX - S.P.L.								
							000000000000000000000000000000000000 -Peak								
						IDLE	XXXXXXX - S.P.L.								
							0000000000000000000 + Peak								

Working condition: **UP-DOWN**

Number	Appendix A	No. of Vehicles	VEHICLE INFORMATION			NOISE LEVEL IN dBA	80	85	90	95	100	105	110	115	120
			Type	Factory	h.p.										
2	1	1	Service	Teledyne	85	UP	XXXXXXXXXXXXXXXXXXXXXX - S.P.L.								
							000000000000000000000000000000000000 - Peak								
						DOWN	XXXXXXXXXXXXXXXXXXX - S.P.L.								
							000000000000000000000000000000000 - Peak								
3	1 2	3	Crane truck	Teledyne		UP	XXXXXXXXXXXXXXXXXX + S.P.L.								
							000000000000000000000000000000000000 - Peak								
						DOWN	XXXXXXXXXXXXXXXXX - S.P.L.								
							000000000000000000000000000000 - Peak								
						UP									
						DOWN									

Measurement Results

Engine states: W. O. T. — IDLE

Number	Appendix A	No. of Vehicles	VEHICLE INFORMATION				NOISE LEVEL IN dBA (80 85 90 95 100 105 110 115 120)
			Type	Factory	h.p.		
4	2	1	Tractor	Ford	34	W.O.T.	XXXXXXXXXXXXXXXXXXXXXXXXXXXX - S.P.L. DOOO

Measurement Results

Engine states: W. O. T.-IDLE

Number	Appendix A	No. of Vehicles	VEHICLE INFORMATION			NOISE LEVEL IN dBA	
			Type	Factory	h.p.		80 85 90 95 100 105 110 115 120
7	2	2	Truck	Jarvis Clark	135	W.O.T.	XXXX

Measurement Results

Engine states: W.O.T. – IDLE

Number	Appendix A	No. of Vehicles	VEHICLE INFORMATION			NOISE LEVEL IN dBA	
			Type	Factory	h.p.		80 85 90 95 100 105 110 115 120
10	1 2	3	Scooptram	Eimco	100	W.O.T.	XXXX

Measurement Results

Working condition: UP-DOWN

Number	Appendix A	No. of Vehicles	VEHICLE INFORMATION			NOISE LEVEL IN dBA	
			Type	Factory	h.p.		80 85 90 95 100 105 110 115 120
10	1 2	2	Scooptram	Eimco	100	UP	x x x

VOL. 3C Report 13

86-122 K.C. Butler

Personal noise dosimetry survey of
various occupational groups at
four Potash mines in Saskatchewan

1986

PERSONAL NOISE DOSIMETRY SURVEY OF VARIOUS OCCUPATIONAL GROUPS AT FOUR POTASH MINES IN SASKATCHEWAN

by

K.C. Butler*

ABSTRACT

This report presents a personal noise dosimetry survey of four Potash mines in Saskatchewan over a four month period. Most job categories on the surface and underground were surveyed at least once, and the occupations with higher noise exposures were surveyed numerous times. Personal noise dosimeters were worn by the workers for a minimum of 8 hours and the data were analyzed on a personal computer. The majority of employees tested had time weighted averages (t.w.a) over 85 dBA, and would, therefore, be advised to wear approved hearing protection. The majority of occupations with a greater noise exposure are in production, but some maintenance occupations had high dBA levels as well. Further noise research in the Potash mines of Saskatchewan is recommended. This could include audiometric testing of employees, as well as investigations of problem noise areas and possible control measures.

Keywords: Noise exposure; Noise dosimeter; Time weighted average.

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DOSIMÉTRIE DU BRUIT TOUCHANT DIFFÉRENTS GROUPES DE MÉTIERS DANS QUATRE MINES DE POTASSE EN SASKATCHEWAN

par

K.C. Butler*

RÉSUMÉ

Ce rapport présente une étude dosimétrique sur le bruit touchant les travailleurs de quatre mines de potasse de la Saskatchewan pendant une période de plus de quatre mois. La plupart des types de métiers concernant les activités souterraines ou en surface furent analysées au moins une fois, alors que les emplois exposés à de plus hauts niveaux sonores furent étudiés plusieurs fois. Des dosimètres personnels de bruit ont été portés par des travailleurs pendant un minimum de huit heures et les données ont été analysées à l'aide d'un ordinateur personnel. La majorité des employés testés sont en contact avec des moyennes d'intensité sonore (m.i.s.) de 85 dB et devraient en conséquence porter des appareils réglementaires de protection contre le bruit. La majorité des métiers soumis aux plus haut niveaux sonores sont en production, bien que quelques postes en entretien rencontrent eux aussi de hauts niveaux de décibels. D'autres recherches sur le bruit sont recommandées au sein des mines de potasse, ce qui pourrait inclure autant des tests audiométriques sur les employés qu'une recherche des zones sensibles au bruit et des mesures pour corriger ce problème.

Mots-clés: exposition au bruit; dosimètre pour le bruit; moyenne d'intensité sonore.

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CONTENTS

	Page
ABSTRACT	i
RÉSUMÉ	iii
INTRODUCTION	1
FUNDAMENTALS OF NOISE	2
NOISE SOURCES AND CONTROLS	3
EXPERIMENTAL PROCEDURE	4
RESULTS AND DISCUSSION	6
CONCLUSION	37
ACKNOWLEDGEMENTS	38
REFERENCES	38

TABLES

No.		
1.	Number of tests, time-weighted average, and rank for various job categories on surface at Mine A	10
2.	Number of tests, time-weighted average, and rank for various job categories underground at Mine A	11
3.	Number of tests, time-weighted average, and rank for various job categories on surface at Mine B	16
4.	Number of tests, time-weighted average, and rank for various job categories underground at Mine B	17
5.	Number of tests, time-weighted average and rank for various job categories on surface at Mine C	22
6.	Number of tests, time-weighted average, and rank for various job categories underground at Mine C	23
7.	Number of tests, time-weighted average, and rank for various job categories on surface at Mine D	30
8.	Number of tests, time-weighted average, and rank for various job categories underground at Mine D	31

FIGURES

1a.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine A	12
1b.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine A	13
2.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine A	14

No.		Page
3a.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine B	18
3b.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine B	19
4.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine B	20
5a.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for the surface at Mine C	24
5b.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for the surface at Mine C	25
5c.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for the surface at Mine C	26
6a.	Comparison of cumulative dBA to percent dose/allowable for each occupation underground at Mine C	27
6b.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine C	28
7a.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation on surface at Mine D	32
7b.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation on surface at Mine D	33
7c.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation on surface at Mine D	34
8a.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine D	35
8b.	Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine D	36

INTRODUCTION

Saskatchewan has 40% of the world's potash reserves, estimated at 130 billion tonnes muriate of potash with a capacity of 12.9 million tonnes KCl per annum, providing employment for 3,300 people. The fertilizer industry accounts for 90-95% of the potash consumed. Up to 95% of Saskatchewan's production is exported abroad, with 70% going to the United States, while the remainder is consumed domestically (1).

The mining techniques used in potash mines are unlike the drill/blast/muck system in hard rock mines. The method employed by the potash mines tested, uses a continuous mining process whereby mining machines (borers) cut several passes through an area, with the mined ore being transported in the circuit of a series of conveyor belts and skipped to the surface. The number of passes made, and the number of levels cut are dependent upon the geology and ground conditions of the particular area and the mining techniques developed at the mine.

Noise surveys at various potash mines have been divided into two major areas: underground, and surface. Underground noise sources are trucks, jeeps, ventilation fans, skip and cage, sledge hammers, Hilti guns, mobile diesel equipment, pumps, mining machines, conveyors, compressors, compressed air equipment and compressed air. Surface noise sources are exhaust fans, pumps, dryers, cyclones, compactors, compressed air equipment and compressed air, diesel trucks, forklifts, and tractors.

This noise survey was initiated to determine specifically which work groups had higher exposures to noise thereby helping to define the requirements for audiometric testing. These tests would also help to assess the authenticity of compensatory claims. Finally, it would alert officials to occupations with higher than desirable exposures to noise.

FUNDAMENTALS OF NOISE

Two important aspects of a sound wave are the intensity (amplitude), and the pitch (frequency). Noise measurements are usually only thought to be associated with the intensity level, but frequency is also an important factor. Higher frequencies can cause greater hearing damage (2) since most hearing impairment occurs in the 4-6 KHz range (3).

Sound intensity measurement uses two means to achieve a decibel (dB) value, either pressure, or power, and both are expressed as a ratio. For the Sound Pressure Level (SPL), a reference pressure of 0.00002 Nm, or 0.0002 μbar have been chosen since this is thought to represent the smallest sound an average young adult can hear in quiet surroundings (4-6) and is given by the following formula:

$$SPL = 10 \log (P/P_{ref})^2$$

$$= 20 \log (P/P_{ref}),\ dB \qquad \text{Eq 1}$$

where p is sound pressure in N/m^{-2} or Pa, and P_{ref} is reference pressure of: $2.0 \times 10^{-6}\ Nm^{-2}$.

The Power Level ratio (PWL) of determining the decibel level and sound intensity is expressed in W/m^2 which is the difference between the atmospheric and the actual pressure during a compression or rarefaction of a sound wave (4-6), and is given by the following formula:

$$PWL = 10 \log(W/W_{ref}),\ dB \qquad \text{Eq 2}$$

where W is the acoustic power of the sound source in watts, and Wref is the reference power which is: 10^{-12} W.

The Occupational Health and Safety Branch of the Government of Saskatachewan has ruled the "equal energy principle" of the International Organization for Standardization (ISO) is to be used (7) to determine the dB level and length of exposure. From Equation 2, a doubling or halving of

acoustic power (watts) results in a 3 dB increase or decrease. Using the 85 dB criterion where this level is equal to a 100% dose over an 8-hour period, every 3 dB increase over 85 dB results in a doubling of power and dosage and a halving of the allowable exposure. Conversely, every 3 dB decrease below 85 dB produces the opposite effect.

NOISE SOURCES AND CONTROLS

There are three types of noise sources (8):

Mechanical	Fluid	Electrical
Vibration	Pneumatic	Transformer hum
Friction	Hydraulic	Arcing
Impact		

Apart from the above, noise can be further divided into three components (5,6,9), namely: noise source, path of noise and the receiver.

Engineering solutions for the above are to modify the forces within the source by redesigning, servicing or isolating the noise source. The noise path may be altered by the use of screens and/or enclosures, or moving the operator away from the noise source. The receiver can be enclosed or provided with hearing protection (4,6). The noise source or the path are the ideal means of dealing with a noise problem, but often the only practicable solution is to engage the problem at the receiver.

Because personal hearing protection is used considerably, there has been extensive research into this field. Sound energy reaches the ear by four different means (10):

(1) through bone conduction (skull);

(2) vibration of the protective device;

(3) passing through leaks in the protector;

(4) acoustic leaks around the protective device.

Since the human ear is most sensitive to damage in the 1 to 4 KHz range (2), sound absorbing material is designed to attenuate that range of frequency. Ear protection devices fall into four categories: ear plugs, semi-inserts, ear muffs and helmets. These protection devices should have the following qualities: they should attenuate at least 20 to 30 dB, be comfortable and not have harmful side effects, e.g., skin disorders, ear infections (10). Yet, in the real world, often none of these criteria are met. In many cases attenuation is no better than 10 to 15 dBA, or 10 to 15 dBA less than the figure claimed by the manufacturer and this problem is quickly reduced with usage, due to wearing out of the cushion, or reduction in clamping force (11). Sometimes, improperly matched ear muffs and plugs may provide less protection than that provided by each of the protectors worn alone (7).

EXPERIMENTAL PROCEDURE

Testing at the four mines was done using a personal noise dosimeter, the Metrologger db 301, manufactured by Metrosonics Inc. The db 301 is a pocket size data logger which records time history. This instrument has a dynamic range of 64 dB, and a frequency response which is 'A' weighted, meaning the instrument is designed to respond to frequencies in the range of normal human hearing. A plug-in PROM (Programmable Read Only Memory) allowed, in these tests, for the dynamic range to be set from 60 to 123 dB with a baseline of 60 dB. During operation, each minute of noise exposure gives 240 samples (4 samples/sec), and each minute is stored sequentially as a count. An L_{eq} value is calculated based on the 3 dB exchange rate using the following formula:

$$L_{eq} = 10 \log (1/N) \Sigma 10^{0.1 L_i} \qquad \text{Eq 3}$$

where, N is the number of samples , and L_i is the value of each sample in dB.

These sequential values are stored in the logger's memory. The type of microphone employed was a Quest 1/2 inch ceramic, with a 1 m length of cable.

The data from the logger were transferred into a computer interface model DL600 manufactured by Leq Instruments of Brampton, Ontario. From here the data were processed by an Apple II Plus computer using a program provided by Leq Instruments. The data from each logger were processed to give a cumulative value and percent dose based on the 85 dB criteria of the ISO with 3 dB increments. The program provided an amplitude distribution and a time history graph.

At each mine, a slate of job categories were listed to determine which occupational groups would be tested. Sample size was determined by the following:

(1) the perceived noise exposure to that group;

(2) the number of employees in the group population;

(3) the number available each day sampling was done;

(4) the availability of different individuals within the population;

(5) the work schedule of individuals;

(6) the length of time sampling could be done.

At each mine testing was divided into two groups: underground and surface. The schedule was such that each group would be completely tested before moving onto the next. Every morning 8 to 10 selected voluntary employees were issued a calibrated dosimeter and given a brief explanation on its use. The dosimeter was enclosed in a protective aluminum case which in turn was mounted to the safety belt with the microphone clipped to the collar.

The dosimeter was worn throughout breaks and lunch periods. After eight hours the logger was collected and the data were dumped into the computer for analysis. These processed data were analyzed for current and cumulative L_{eq}, current and cumulative percent dose, maximum and minimum dBA

levels, amplitude distribution and L_{eq} time history graphs, with a hard copy printout being given and only the raw data being stored on disc. Following this, the battery was replaced and the unit's calibration was checked. If recalibration was necessary then the day's data from that particular logger were considered unreliable and discarded.

RESULTS AND DISCUSSION

The noise survey was conducted over a period of four months with a total of 608 sucessful tests distributed among 104 job categories. A failure rate of 10 to 20% per day was considered normal. Dosimeter reliability was quite acceptable. At the end of the project only 2 out of 13 instruments failed and could not be repaired on site.

Microphones, however, were unreliable and had to be constantly repaired. The 1/4 inch microphone which came standard with the dosimeter was replaced by a Quest 1/2 inch model. This microphone required a LEMO connector to be soldered at the Elliot Lake Laboratory. However, this connection resulted in numerous failures due to solder joints breaking.

In the final analysis of data it was decided that there would be no attempt to compare the mines to one another. Because of variations in job description and duties, mine and milling techniques and design, only the different occupations within each mine are compared. The graphs and tables serve only to indicate the relative noise exposure for the various occupations within each mine.

The figures in the tables are structured so as to show the number of completed tests for each occupation, the mean time weighted average, and the rank, from noisiest to quietest. The vertical scale of the lower graph shows the dBA level with the standard deviation. Because many authors (3,6,7,11) have discussed the implications of short periods of loud noise, the maximum

dBA value has also been shown, though these values should not be confused with impact noise. The vertical scale on the top graph shows time weighted average as a percentage of dose and allowable exposure. This graph, when compared to the bottom one serves to indicate how relatively small differences in dBA between occupations can develop into large differences when viewed as a percent of allowable dose, since this is the criterion used to determine the exposure time.

It should be emphasized that per cent dose and allowable exposure time on the y-axis of the upper graph are for the unprotected individuals. For those wearing approved hearing protection the per cent dose is reduced, thereby increasing the allowable exposure time. As stated in the introduction, an attenuation of 10 to 15 dBA is the practicable maximum to be expected, and for a cumulative dBA - L_{eq} exposure greater than 95 dBA an individual wearing proper hearing protection may still be overexposed.

To verify some excessive noise levels, a sound level meter, type 2225, manufactured by Brüel and Kjaer Instruments of Naerum, Denmark, was used at each mine. This sound level meter was used for routine testing of various areas and the results were compared with the values from the loggers. Apart from the dosimeters being calibrated daily, a tone of 94 dBA at 1 KHz was occasionally loaded into the dosimeter and cross-referenced on the computer.

The potash ore, Sylvinite, a sedimentary rock, is made up of about 45% KCl, 55% NaCl, and 5% clay. The compressive strength of the Sylvinite is approximately 1/10 that of the Quartzite found in the Elliot Lake area (12). Potash, because of its low density and relative softness, absorbs sound waves and this affects the reverberation time. Crocker and Kessler (13) have related the sound absorption of the material to its hardness and density. Reverberation time, 'T', is defined as the time required for sound to decay 60 dB (3,13), and it is affected by the characteristics of the ground being mined

as well as the tunnel dimensions and the absorption of the room. Depending on which pass the mining machine is on and the dimensions of the tunnel, the noise level may vary considerably.

The mining machines are electrically powered via cables from the surface. Noise is produced by various electric motors on the mining machine, the hydraulics, the ventilating fan, the cutting bits/chains, and the conveyor belt. Usually, the greatest noise exposure is to the operator, but the back-up operator(s), whose main duty is to direct the ore from the mining machine's conveyor belt to the main conveyor, is (are) often exposed to high noise levels from the belts and impact noise from falling ore.

The number of tests per occupational category was due to factors which affected the scheduling. One problem which arose, mostly in the underground production crew, was the men exchanging duties and doing various jobs during their shift. Data from these individuals, who were tested, were felt to be acceptable because this job substitution was considered part of a normal shift. Other job categories in production also have high noise levels which are due to the operation of diesel equipment. Maintenance crews usually have lower time weighted averages since repair work in the field is on equipment which is not in operation and in the shop, the noise is intermittent and usually only occurs when power tools are being operated, or repaired equipment is being tested.

In the mill, during normal production, the noise level may vary considerably from area to area, and generally the use of hearing protection is required. Specific occupations, such as sandblaster/painter have noise levels which are variable, whereas others, particularly mill production crews are exposed to constant noise levels.

Though all four mills are noisy, there are nevertheless significant variations in time weighted averages, which are due, in part, to plant layout,

building material (concrete or steel grating floor), maintenance schedule for the equipment and variations in the milling process. Also, in each mine, employees during their shift have specific duties, as well as regulations which limit the amount of time which may be spent in lunch rooms or control rooms, away from the noise. Since the data from the various mines are not being compared to one another, the results within each mine include a comparison of surface and underground operations with a brief discussion of the noisiest occupations which is given below.

MINE A

There were a total of 134 tests, with 75 underground and 59 on the surface. Of the various surface job categories, 4 of 18 had cumulative dBA values of 85 dBA or less. The highest noise level occupations were in the production crews, with the maintenance and loadout crews having lower noise levels.

For surface operations, most production employees had high readings, but maintenance categories such as Stationary Engineer, Industrial Technician and Sandblaster/Painter registered the highest noise levels. The time weighted average for Instrument Technician and Sandblaster/Painter varied from day to day due to the nature of their work, and for occupations such as these hearing protection is worn as required. Most production employees should wear hearing protection continuously since the background noise is usually over 85 dBA.

Of the underground job categories tested, 4 of 11 had a time weighted average of 85 dBA and under. Like the surface operations, occupations with the highest noise levels were in production, with the exception of the maintenance lubricator, whose main source of noise is the lubrication vehicle.

Table 1 - Number of tests, time-weighted average, and rank for various job categories on surface at Mine A.

Job Category	No. of Tests	Time Weighed Average (dBA)	Rank
Utility Operator	3	92	3
Grinding and Desliming Operator	3	93	2
Flotation Operator	4	92	3
Dewatering, Drying & Tails Operator	3	91	4
Product Screening & Dispatch Op.	3	90	5
Compaction Operator	3	86	8
Reagent Operator	2	86	8
Crystallizer Operator	3	91	4
Chute Operator	2	83	10
Mobile Equipment Operator	3	92	3
Weightmaster	2	84	9
Electrician	3	89	6
Industrial Mechanic	9	81	11
Welder	3	87	7
Sandblaster/Painter	4	92	3
Stationary Engineer	4	94	1
Industrial Technician	1	93	2
Shift Foreman	4	83	10

Table 2 - Number of tests, time-weighted average, and rank for various job categories underground at Mine A.

Job Category	No. of Tests	Time Weighted Average (dBA)	Rank
Miner Operator	16	98	1
Back-up Operator	11	90	5
Rehab Operator	1	90	5
Wagonmaster	1	94	3
Service Crew Operator	14	91	4
Lubricator	2	95	2
Electrician	8	85	6
Welder	4	81	8
Heavy Duty Mechanic	5	83	7
Industrial Mechanic	9	85	6
Supervisors	4	91	4

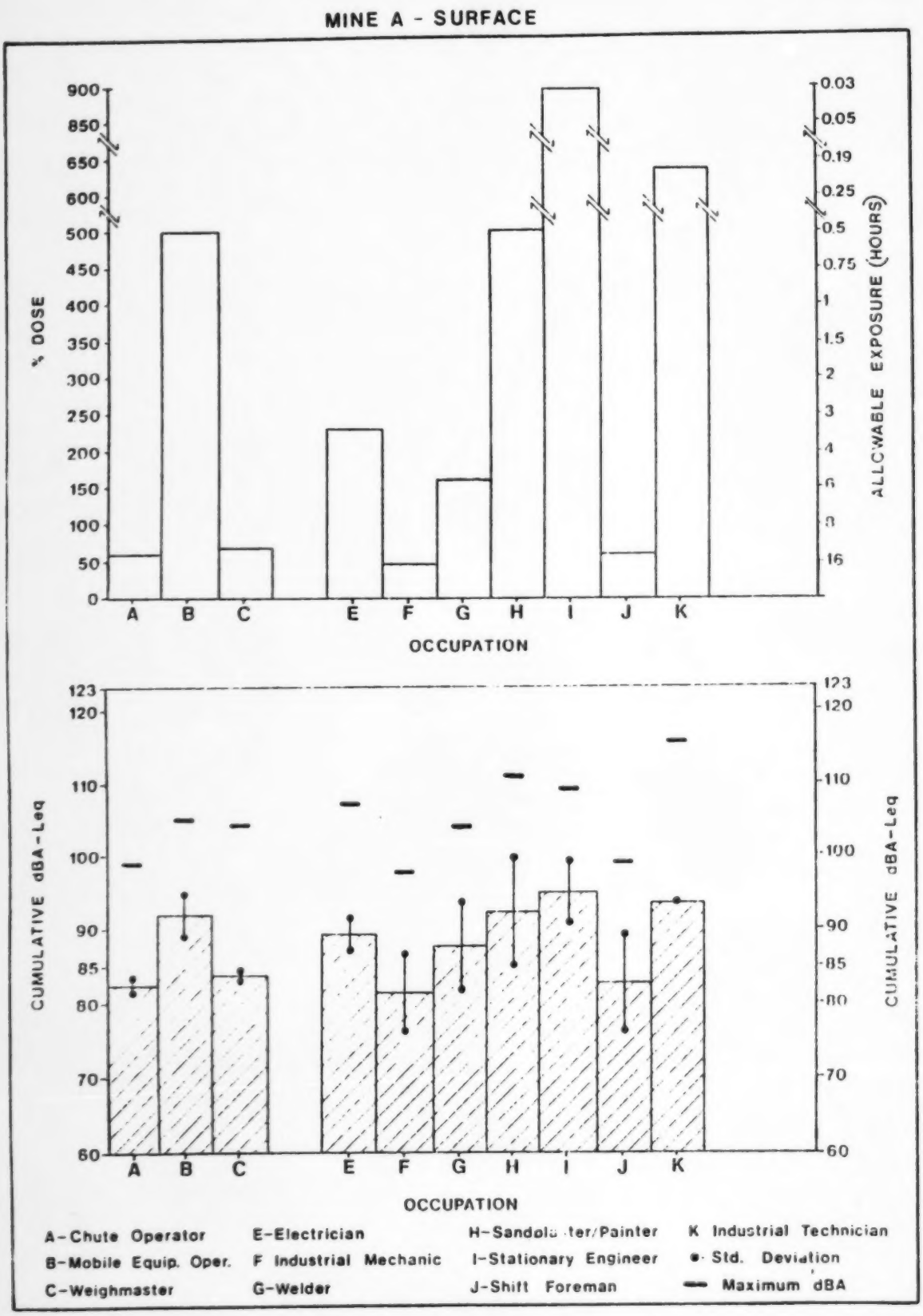

Fig. 1a - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine A.

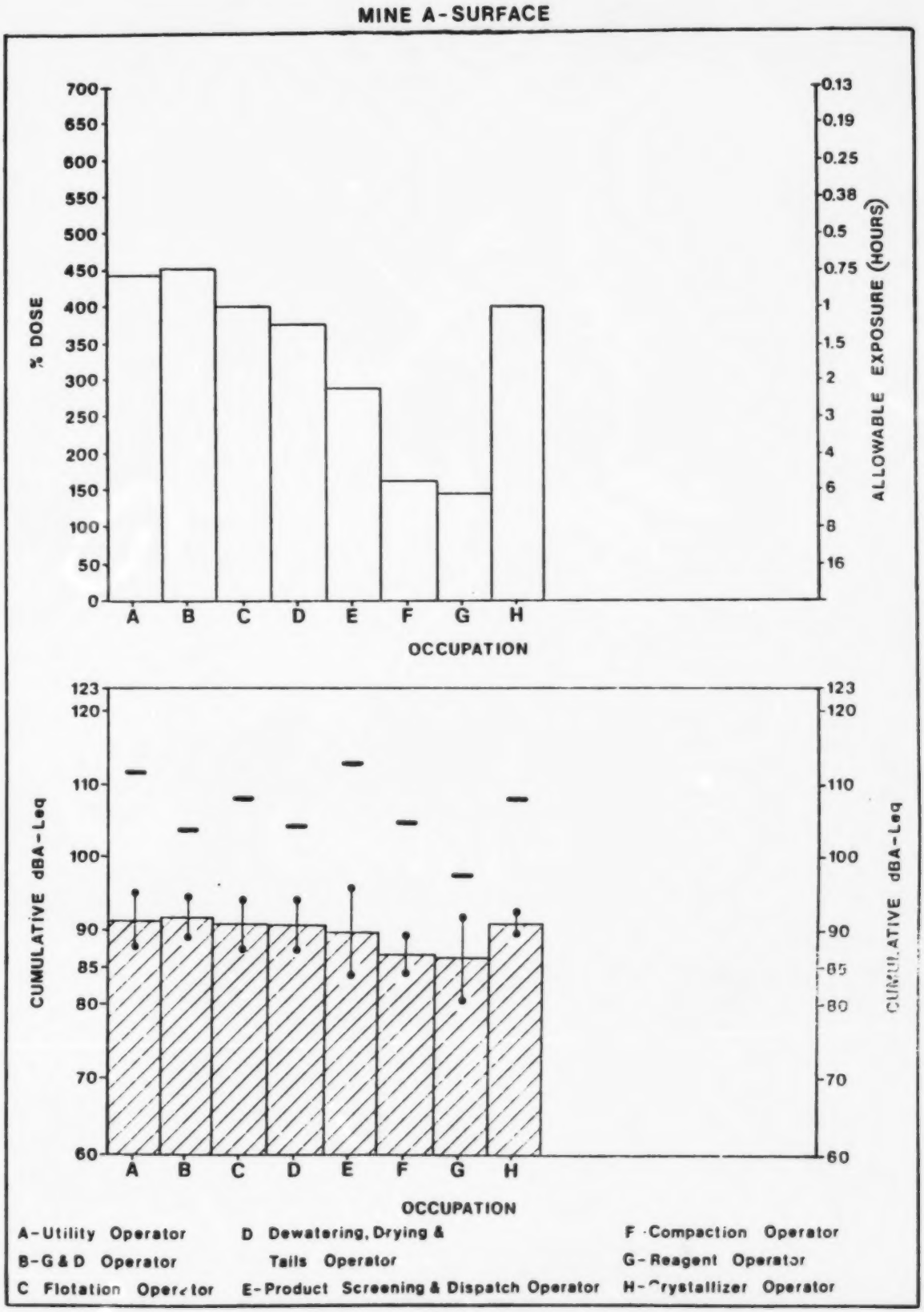

Fig. 1b - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine A.

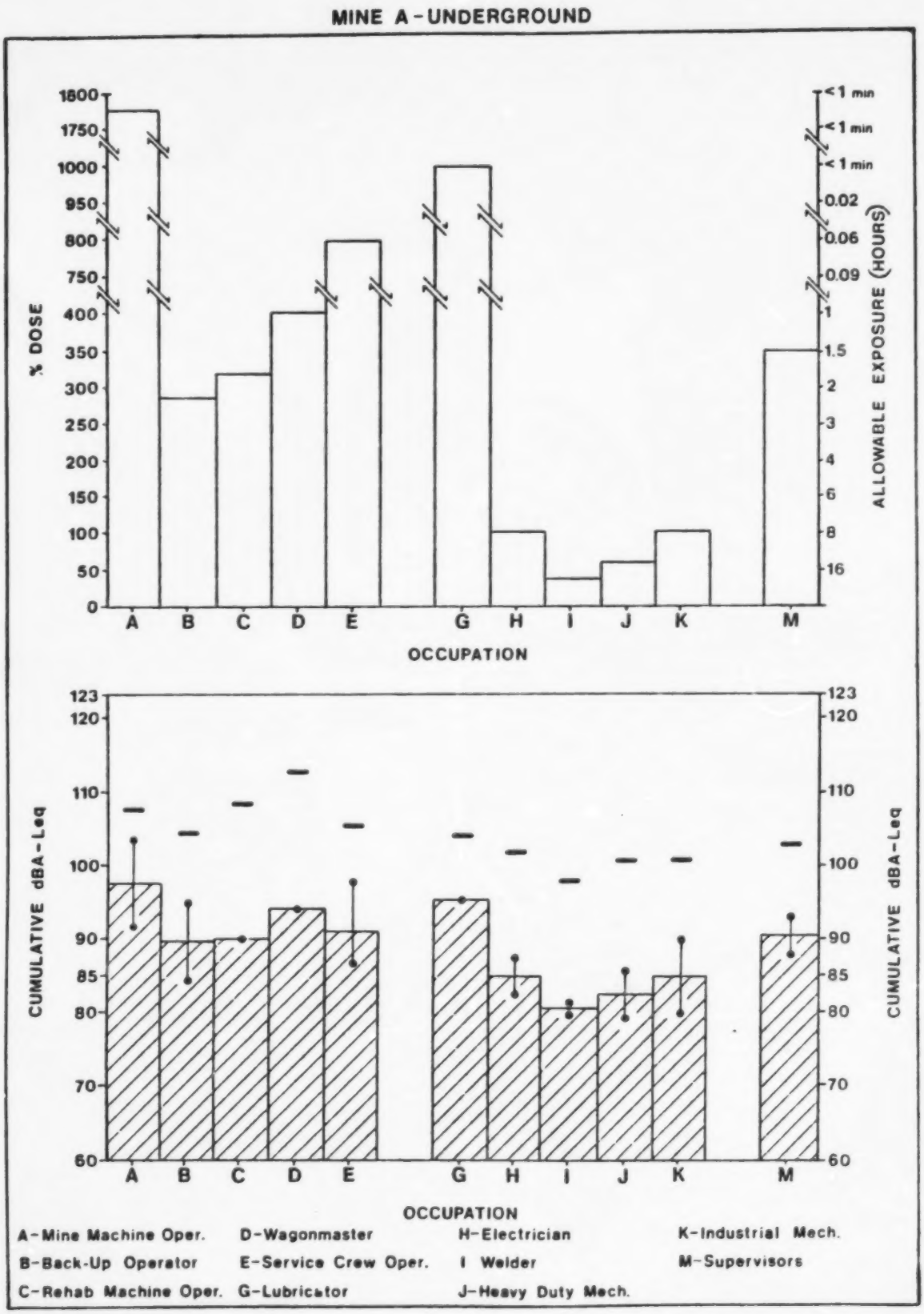

Fig. 2 - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine A.

All other maintenance categories are low and several sound level meter tests verified these low levels. Production categories were all over 90 dBA, with the miner operator having the greater time weighted average. These figures, particularly those who are working with and around the mining machines can vary considerably depending on the operating period of the equipment, the proximity of the noise source to the operator and how often and how long the equipment is operating.

MINE B

In the surface group there were 64 tests and 47 underground tests for a total of 111, making this mine the least surveyed of the four. Of 23 occupations tested on the surface, 4 were 85 dBA or lower. The highest time weighted average values are found generally in the production crews, this being mainly due to plant noise from various pumps, blowers, screens and cyclones. Maintenance crews had the lowest time weighted average due to shop areas being less noisy and work in the mill usually occurring during maintenance shut-downs. Loadout was marginally higher than maintenance with the weighmaster occupation having the highest reading, but since only one sample was taken this result may not be indicative of that job category.

In the underground area there were a total of 13 different job categories tested, and in only two were the levels below 85 dBA. Production crews had the highest noise levels with the occupation of miner operator being the highest. Maintenance crews were, with few exceptions, well above 85 dBA, but because few samples were taken at this mine, and the ability to perform random sampling was limited, it is difficult to explain these high readings. The Brüel and Kjaer, sound level meter was used to sample throughout the mill and underground. In some cases the high readings, which were first seen from the personal noise dosimetry tests were verified. Most often though, the areas when checked with the sound level meter did not have noise levels as

Table 3 - Number of tests, time-weighted average, and rank for various job categories on surface at Mine B.

Job Category	No. of Tests	Time Weighted Average (dBA)	Rank
Utility Man	3	98	2
Screening Operator	4	99	1
Grinding Operator	4	92	3
Flotation Operator	4	92	3
Centrifuge/Dryer Operator	4	92	3
Compaction Operator	4	98	2
Crystallizer Operator	4	89	5
Reagent Operator	2	87	7
Loadout Operator	3	85	9
Car Loader	4	86	8
Weighmaster	1	89	5
Electrician	3	90	4
Industrial Mechanic	2	89	5
Industrial Mechanic (Wet End)	3	90	4
Industrial Mechanic (Dry End)	3	92	3
Heavy Duty Mechanic	1	82	10
Welder	4	92	3
Machinist	1	85	9
Sandblaster/Painter	2	88	6
Construction Man	1	89	5
Stationary Engineer	4	90	4
Instrument Man	2	89	5
Carpenter	1	81	11

Table 4 - Number of tests, time-weighted average, and rank for various job categories underground at Mine B.

Job Category	No. of Tests	Time Weighted Average (dBA)	Rank
Miner Operator	4	102	1
Loader/Bridge Operator	3	87	5
Equipment Operator	5	91	2
Car/Haulage Operator	3	85	7
Construction	3	89	3
Service Operator	1	87	5
Cage Tender	1	79	8
Warehouse	2	79	8
Ventilation Man	1	88	4
Electrician	7	87	5
Industrial Mechanic	10	87	5
Heavy Duty Mechanic	4	86	6
Welder	3	89	3

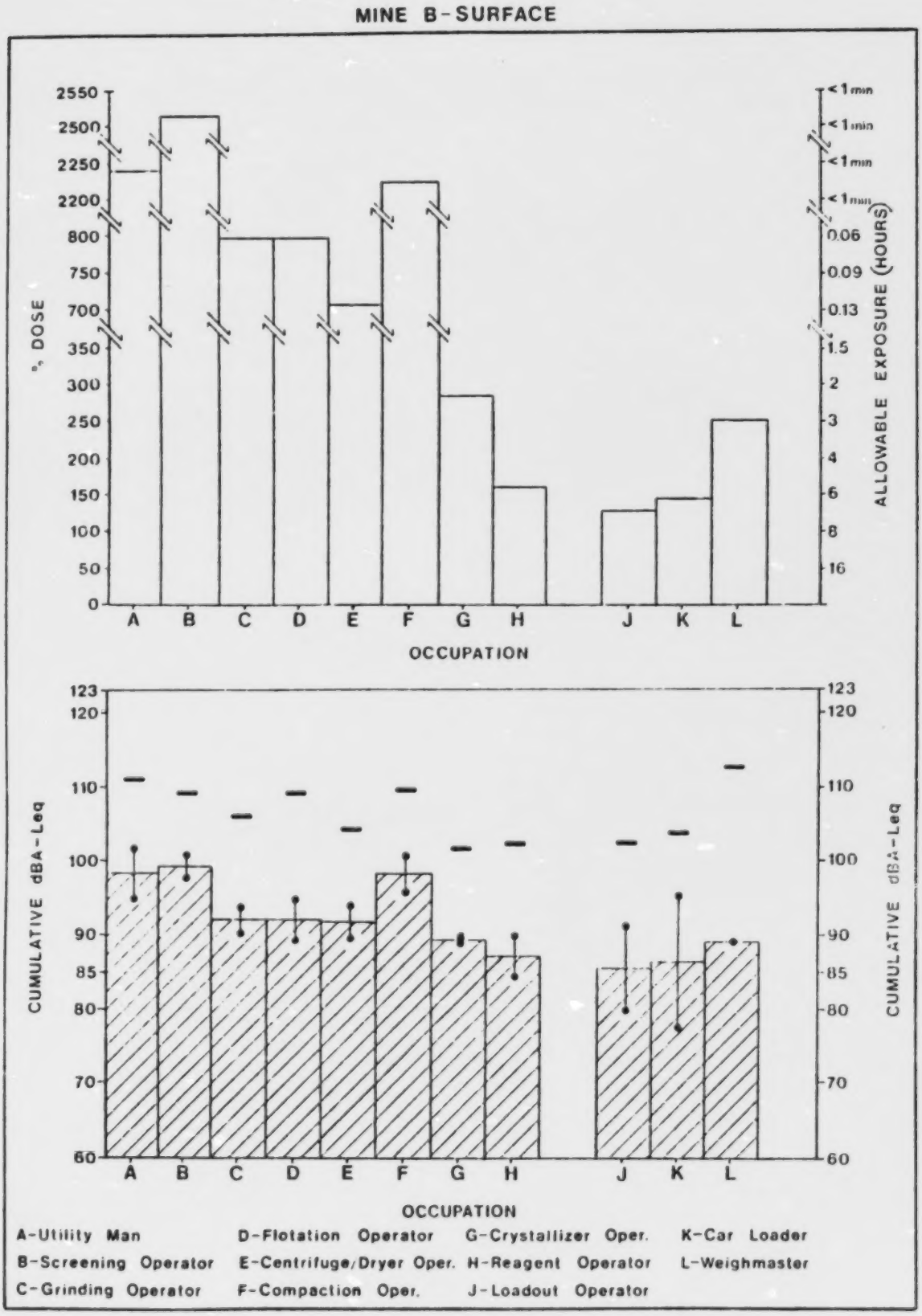

Fig. 3a - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine B.

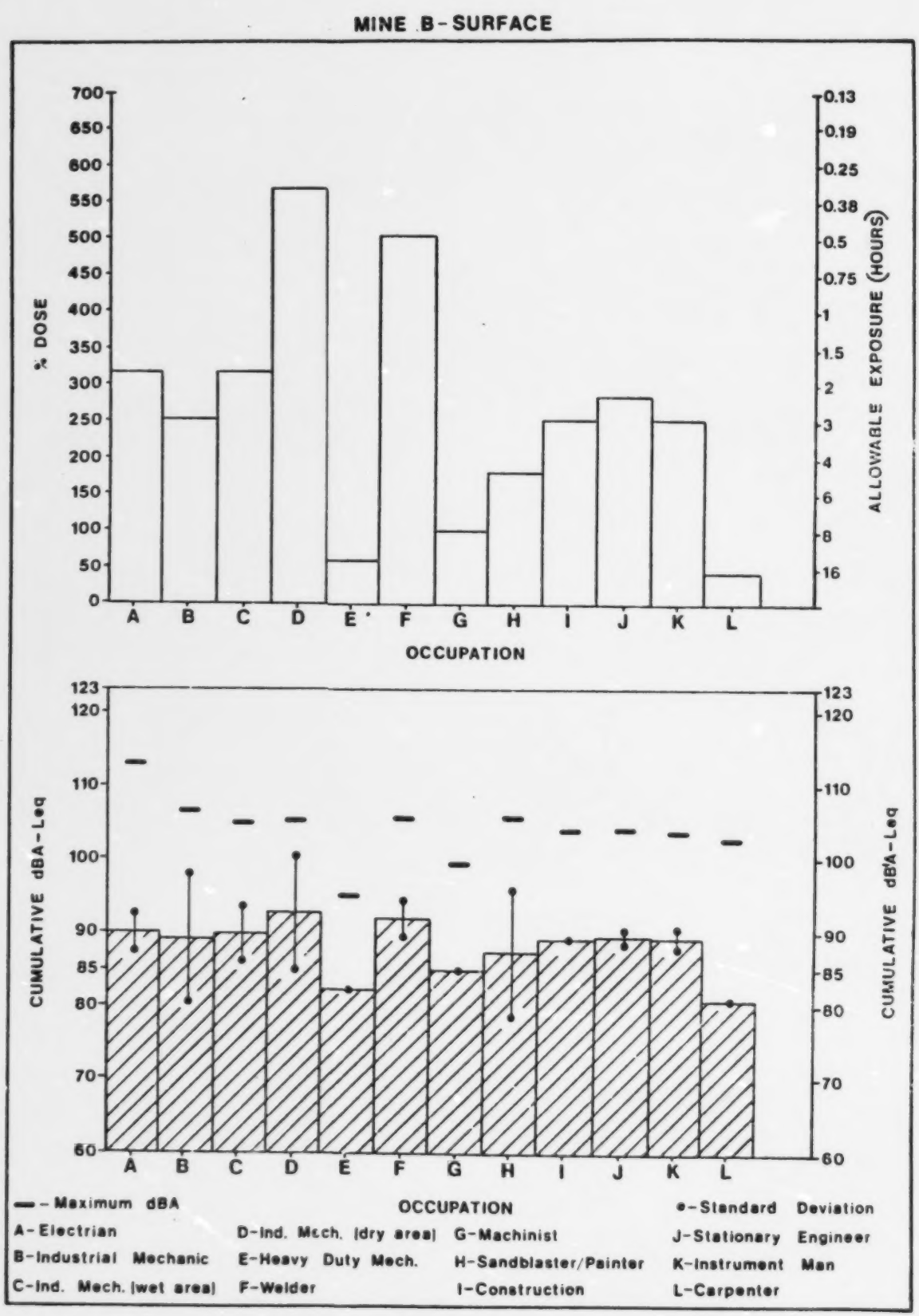

Fig. 3b - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for surface at Mine B.

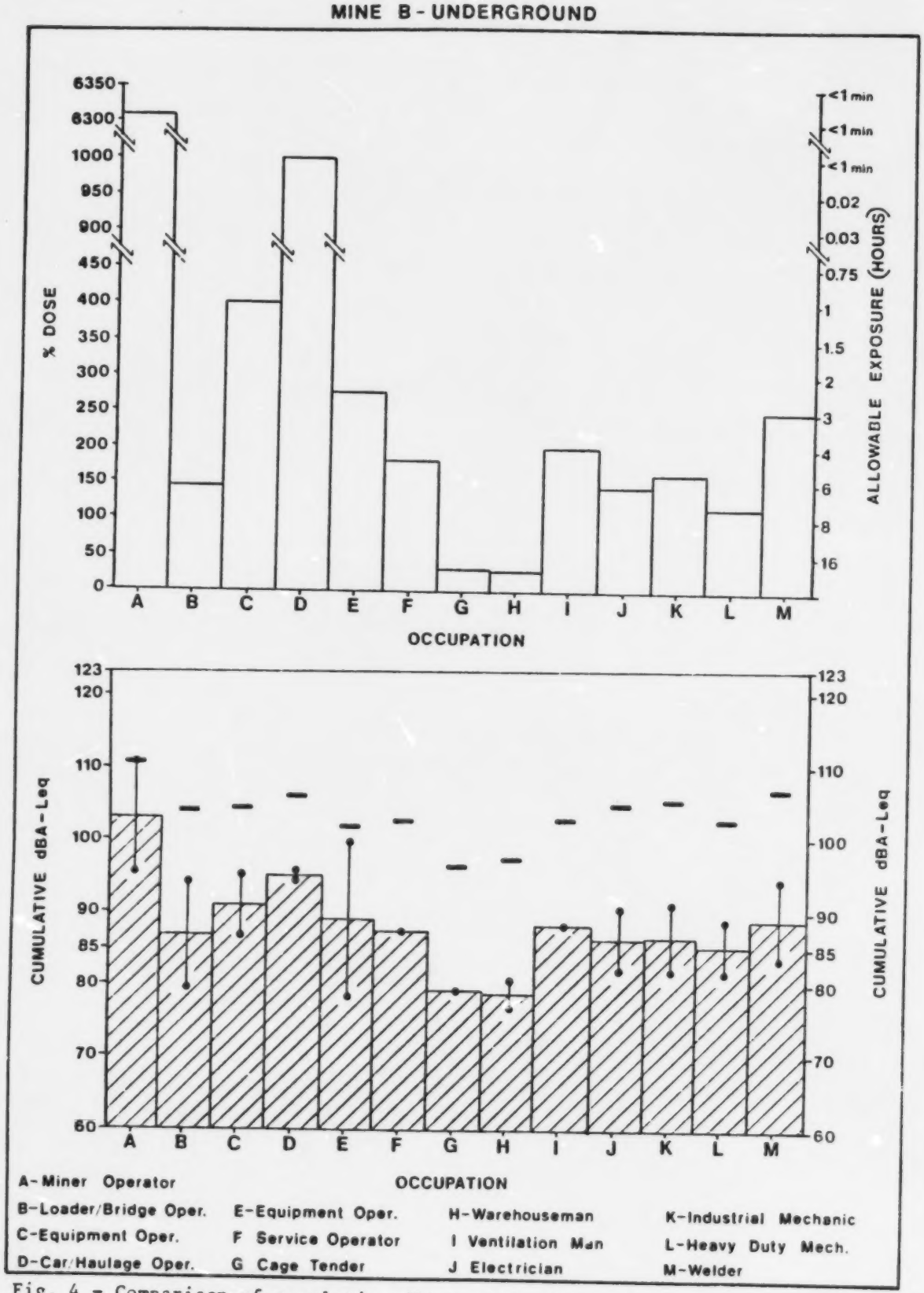

Fig. 4 - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine B.

high as the loggers indicated, rather, they compared with previous values attained by the Occupational Health and Safety Branch of the Saskatchewan Government.

MINE C

A larger number of tests and categories were achieved due to a longer time period and a more flexible schedule. There were a total of 160 tests with a nearly equal dispersion of 81 surface, 79 underground. There were 27 different job occupations on the surface which were tested and 7 of those had a time weighted average of 85 dBA or under. Like the previous two mines, the noisiest occupations were in the production crews, but the variation in noise levels within production was such that some of the least noisy occupations were also found within this group.

On surface there is very little difference in noise levels between production and maintenance crews. The sandblaster/painter had the highest noise level followed by the caterpillar operator in the loadout area. The stationary engineer had one of the lowest noise levels, and the reason for this extreme contrast was due to the construction of a new control room away from the boiler area and the use of computers to monitor and allow adjustments to be made from within the control booth.

Underground, 10 of 18 occupations had time weighted averages of 85 dBA and under, with the highest noise areas also being in production. In the underground area the miner operator, and the back-up operator have, as expected, a high time weighted average, and some of the construction crews have cumulative values which are higher. The high time weighted average for the construction crews may be due to engine noise from various pieces of diesel powered equipment which are used to repair or extend conveyor belts. The maintenance crews generally have a low time weighted average. Most occupations have cumulative values below 85 dBA, and the large sample size

Table 5 - Number of tests, time-weighted average and rank for various job categories on surface at Mine C.

Job Category	No. of Tests	Time Weighted Average (dBA)	Rank
Crushing Operator	4	89	5
Screening Operator	5	88	6
Filtration Operator	4	90	4
Flotation Operator	6	83	6
Compaction Operator	6	91	3
Crystallization Operator	4	88	6
Spare/Utility Operator	1	86	8
Day Crew/Utility Operator	2	80	13
Reagent Operator	1	86	8
Laboratory Technician	1	82	11
Stationary Engineer	3	78	14
Central Control Room Operator	3	77	15
Shift Boss	4	90	4
Scale-Room Operator	1	87	7
Trackmobile Operator	1	89	5
Cat Reclaimer Operator	4	92	2
Sampling/Sealing Operator	2	86	8
Loadout Supervisor	2	91	3
Industrial Mechanic	11	88	6
Heavy Duty Mechanic	2	86	8
Machinist	2	85	9
Welder	3	87	7
Pipe Fitter	1	84	10
Equipment Operator	2	89	5
Carpenter	1	81	12
Electrician	4	87	7
Sandblaster/Painter	1	93	1

Table 6 - Number of tests, time-weighted average, and rank for various job categories underground at Mine C.

Job Category	No. of Tests	Time Weighted Average (dBA)	Rank
Miner Operator	8	90	2
Extensible Operator	7	89	3
Dispatcher	1	68	14
Production Foreman	1	81	10
Rehab/Conveyor/Mobile Equipment Op.	4	88	4
Belt Patrolman	1	89	3
Back-up Operator 2	4	95	1
Back-up Operator 3	10	87	5
Construction Foreman	1	88	4
Surveyors	3	79	11
Industrial Mechanic	15	84	8
Heavy Duty Mechanic	2	83	9
Welder	2	86	6
Machinist	1	78	12
Electrician	13	84	8
Hoistman	1	72	13
Helper	2	85	7
Warehouse	3	79	11

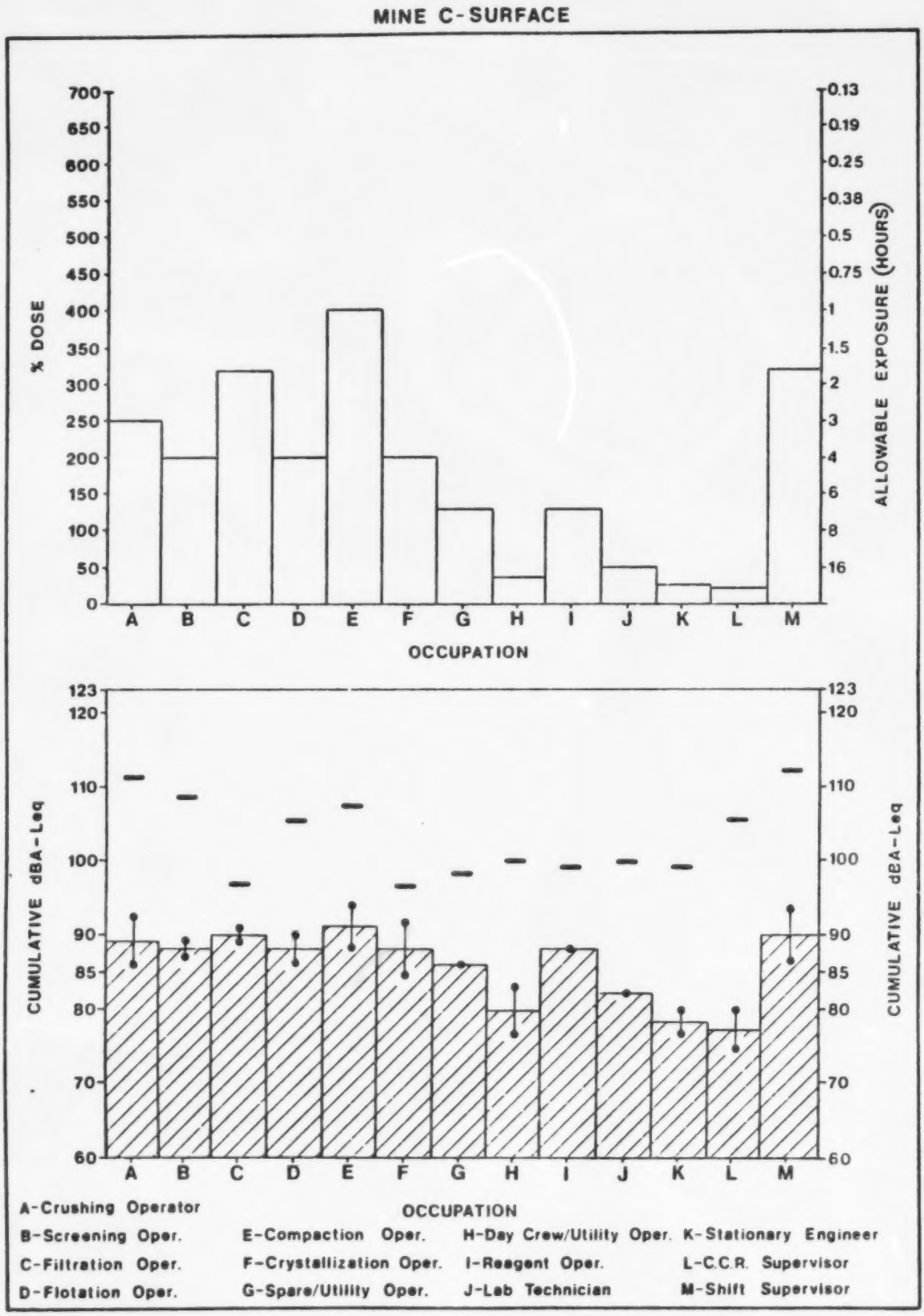

Fig. 5a - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for the surface at Mine C.

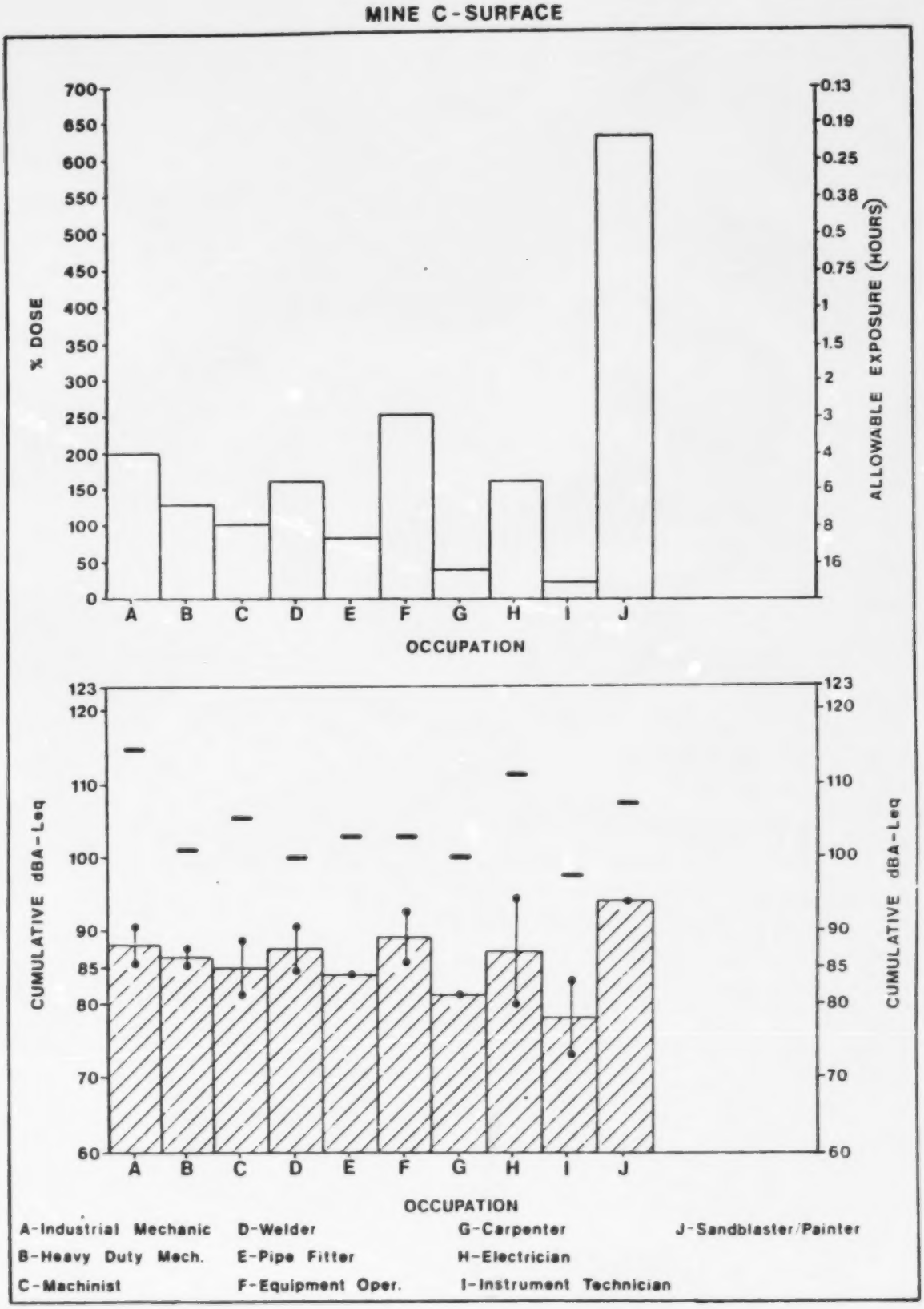

Fig. 5b - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for the surface at Mine C.

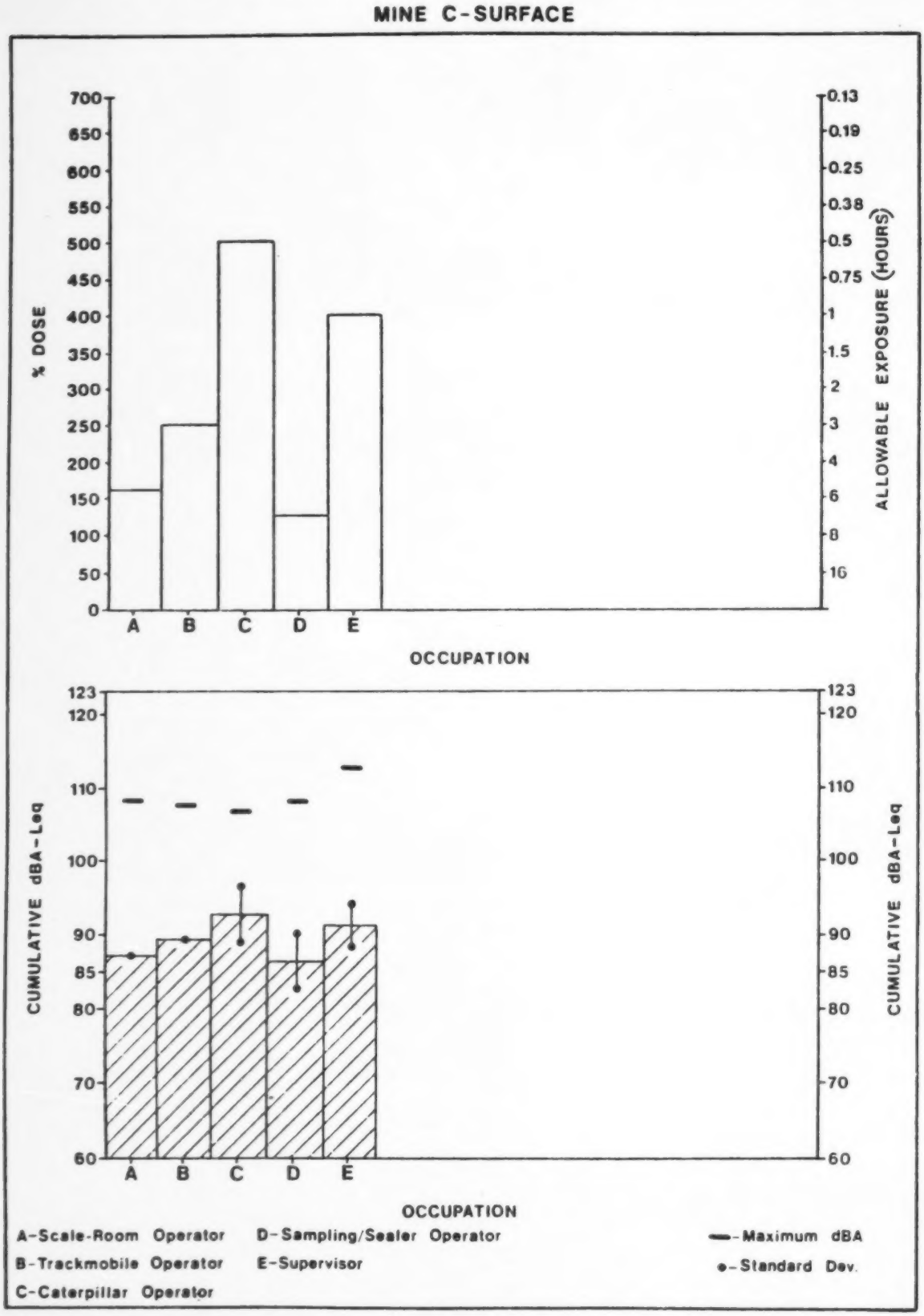

Fig. 5c - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation for the surface at Mine C.

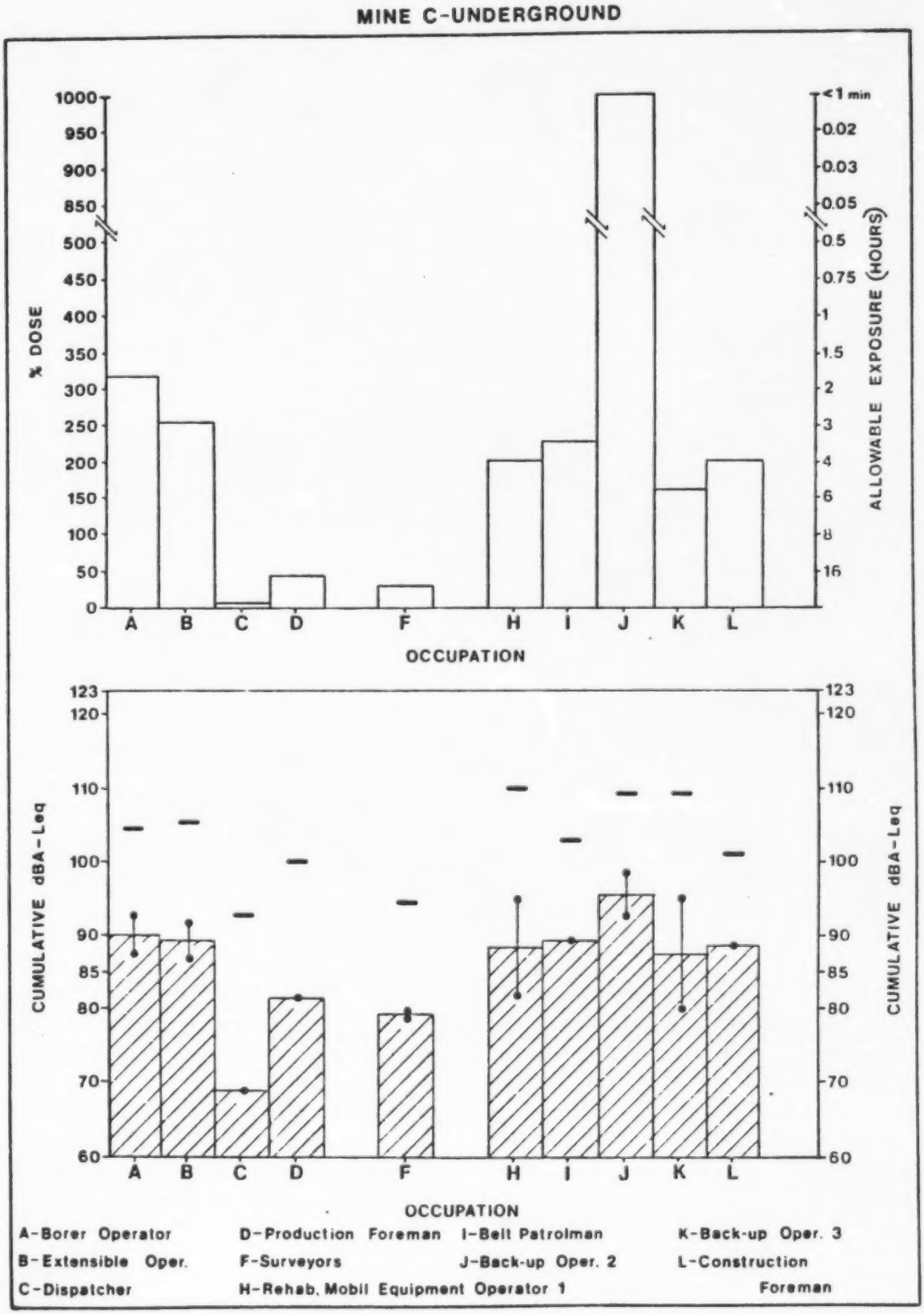

Fig. 6a - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine C.

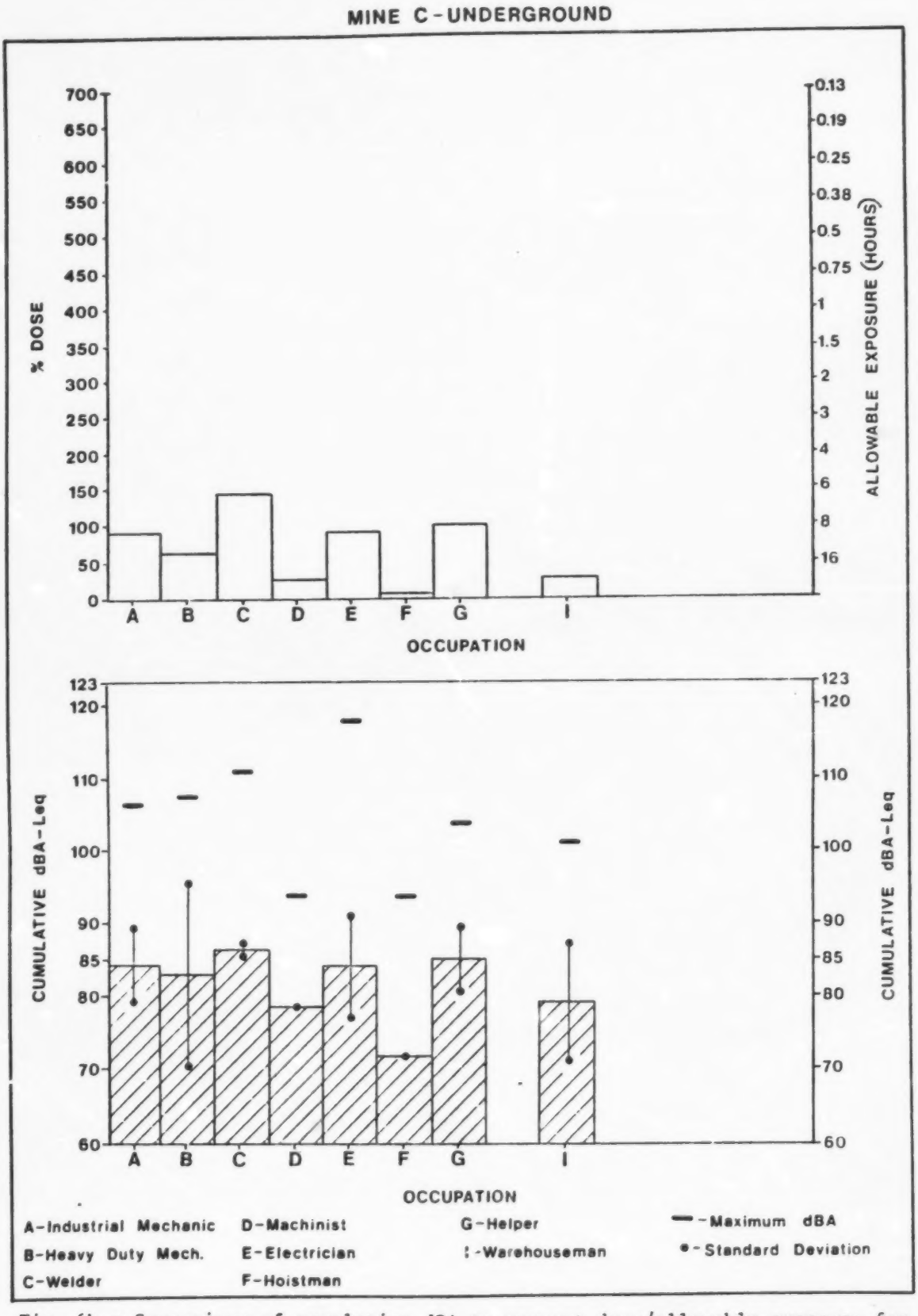

Fig. 6b - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine C.

gives credibility to the accuracy of these results.

MINE D

This was the final mine surveyed and it received the most extensive testing. Of the 203 tests performed, 127 were on the surface and 76 underground. The shift schedule at this mine made underground testing difficult, thereby limiting the number of tests which could be performed in the time frame.

On surface there were 34 groups tested, and 12 were under 85 dBA. The categories with time weighted averages over 85 dBA are distributed throughout the production and maintenance crews.

The mill production crew, with the exception of one job category, had a time weighted average greater than 85 dBA. Background noise in the mill probably accounts for the high noise levels and the control room operator's low time weighted average validates this. In the loadout area, all job categories except for supervisor were over 85 dBA. The maintenance crew, as expected, had variable results. The sandblaster/painter, plumber/gas fitter and stationary engineer have the highest time weighted averages, which are likely due to working with compressed air. Because of the nature of their work, the sandblaster/painter and plumber/gas fitter will have great variability in their time weighted averages depending on their work load and scheduling.

Underground, 9 of 15 job categories had a time weighted average over 85 dBA. As was found in the other mines, the noisiest occupations were in production, all having cumulative values over 90 dBA. The occupation with the highest noise level was the rehab operator who is part of the construction crew, and this is likely due to diesel equipment which is used for conveyor belt extension and repair. Maintenance crews had a high time weighted

Table 7 - Number of tests, time-weighted average, and rank for various job categories on surface at Mine D.

Job Category	No. of Tests	Time Weighted Average (dBA)	Rank
Raw Ore Operator	5	90	5
Screening Operator	19	92	3
Flotation Operator	11	88	7
Crystallizer Operator	6	91	4
Spare/Utility Operator	5	89	6
Metallurgical Lab. Technician	1	85	10
Sample Runner	2	90	5
Pumps & Tails Operator	7	93	2
Control Room Operator	3	78	15
Scale Room Operator	4	86	9
Locomotive Operator	3	87	8
Cat/Reclaim Operator	3	85	10
Loading/Sealing Operator	2	86	9
Industrial Mechanic	8	86	9
Heavy Duty Mechanic	1	74	17
Automotive Mechanic	1	85	10
Machinist	2	86	9
Welder	4	86	9
Pipefitter	1	83	12
Plumber/Gas Fitter	1	92	3
Lubeman	1	87	8
Stationary Engineer	3	92	3
Sandblaster/Painter	3	94	1
Fire Marshall	1	90	5
Tool Crib Man	1	83	12
Electrician	8	84	11
Maintenance Planner	1	77	16
Instrument Technician	3	88	7
Safety Inspector	1	91	4
Carpenter	2	81	16
Warehouse Man	2	77	16
Production Supervisor	6	89	6
Storage & Loadout Supervisor	4	82	13
Maintenance Supervisor	2	87	8

Table 8 - Number of tests, time weighted average, and rank for various job categories underground at Mine D.

Job Category	No. of Tests	Time Weighted Average (dBA)	Rank
Mine Operator	20	91	3
Extensible/Tub Operator	4	93	2
Cross-Conveyor Operator	13	91	3
Rehab/Conveyor/Mobile Equipment Op.	2	95	1
Belt Maintenance Operator	3	87	6
Ventilation Operator	1	83	9
Water Pumping Operator	1	86	7
Industrial Mechanic	8	83	9
Heavy Duty Mechanic	1	83	9
Electrician	12	85	8
Welder	2	90	4
Shaft Maintenance	1	88	5
Mine Engineering Technician	3	80	10
Warehouse Man	1	77	11
Supervisors	4	86	7

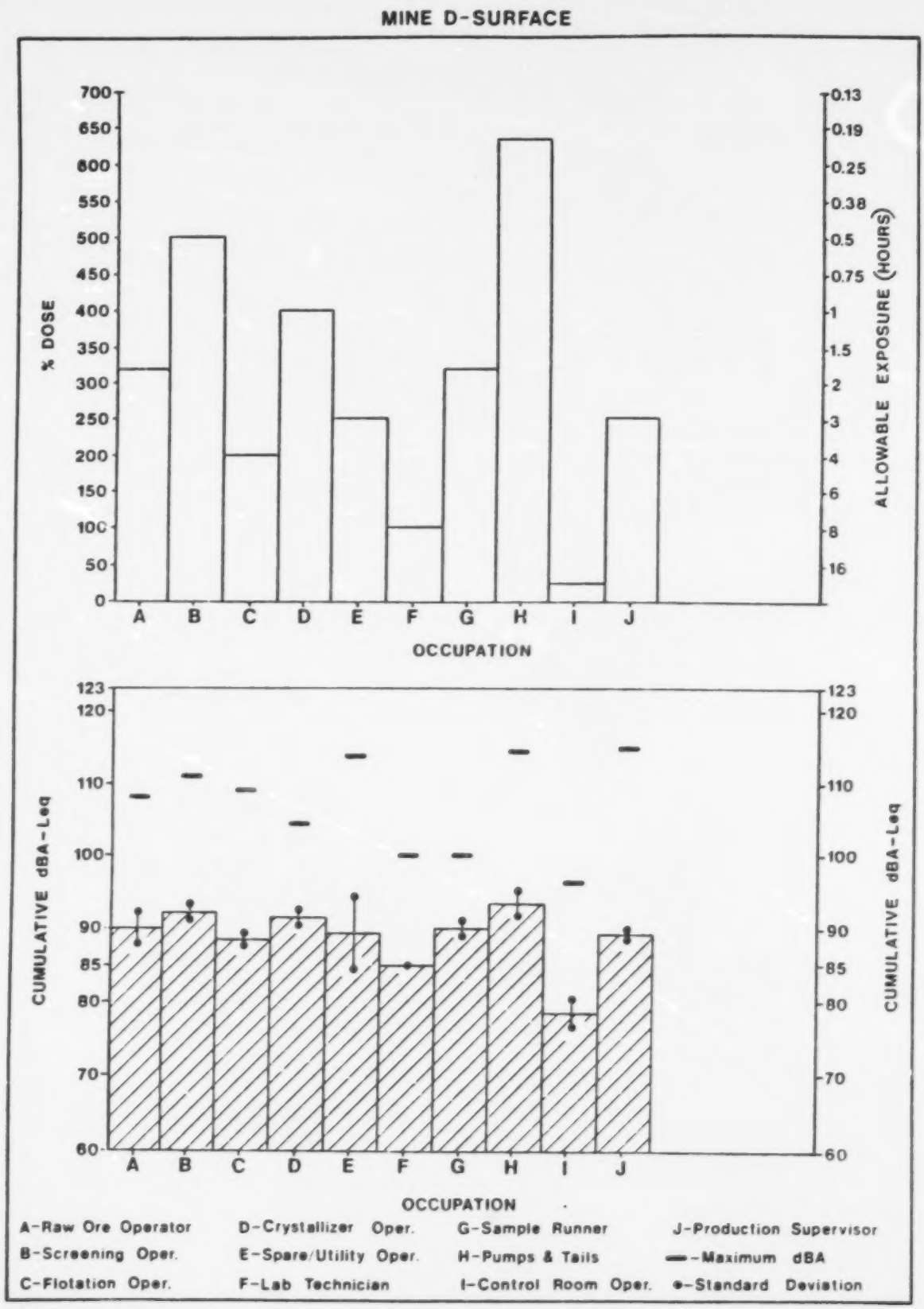

Fig. 7a - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation on surface at Mine D.

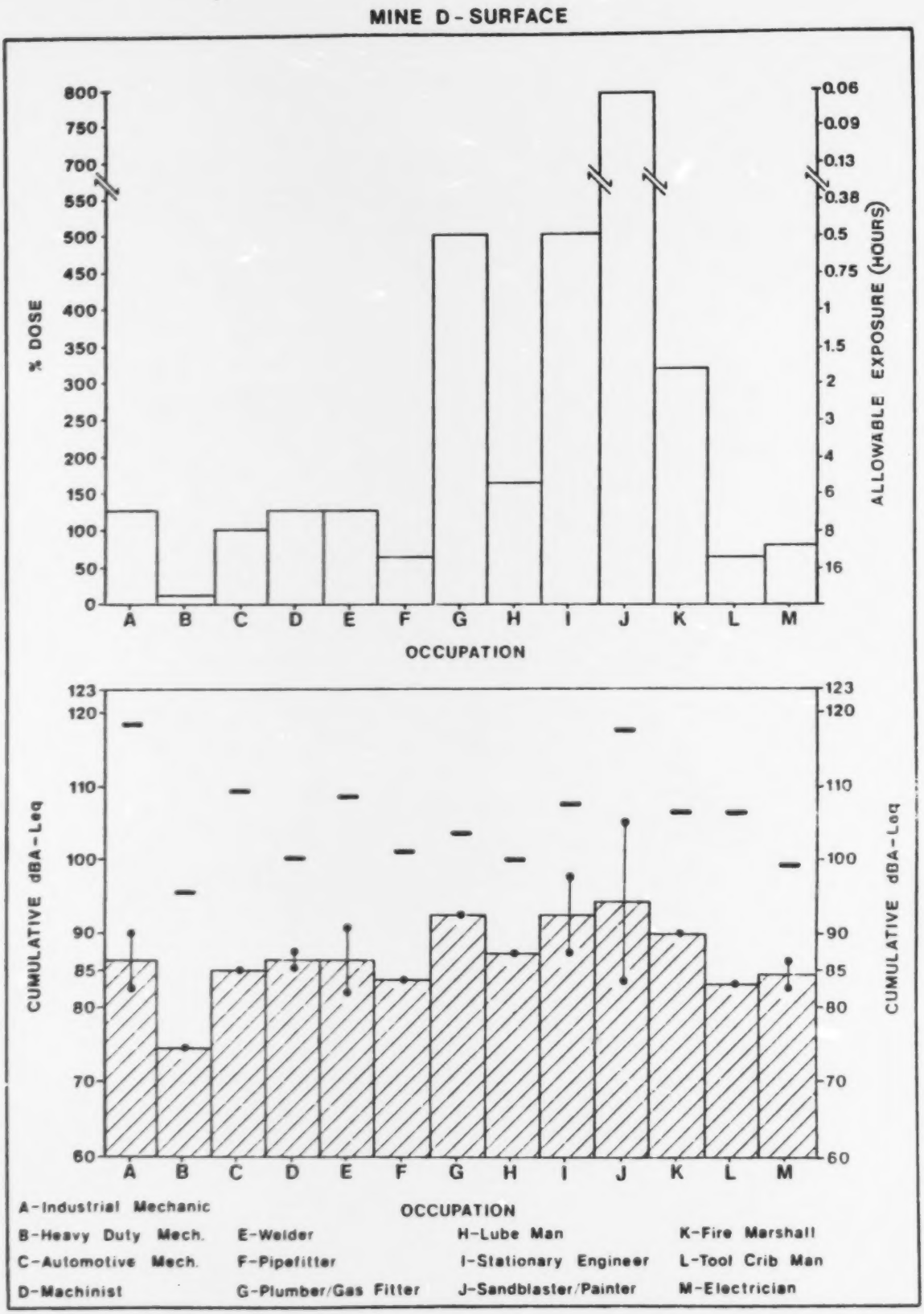

Fig. 7b - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation on surface at Mine D.

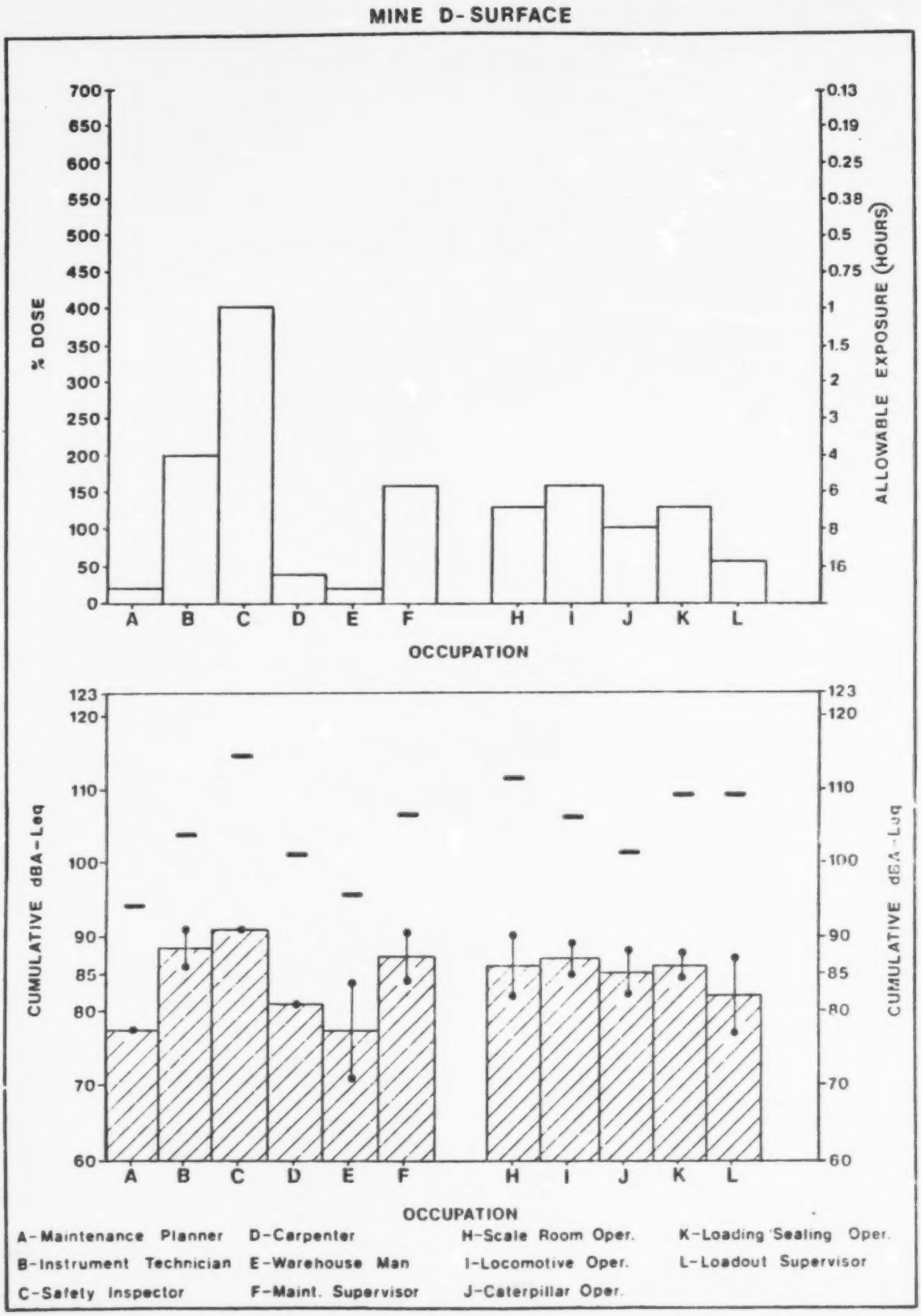

Fig. 7c - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation on surface at Mine D.

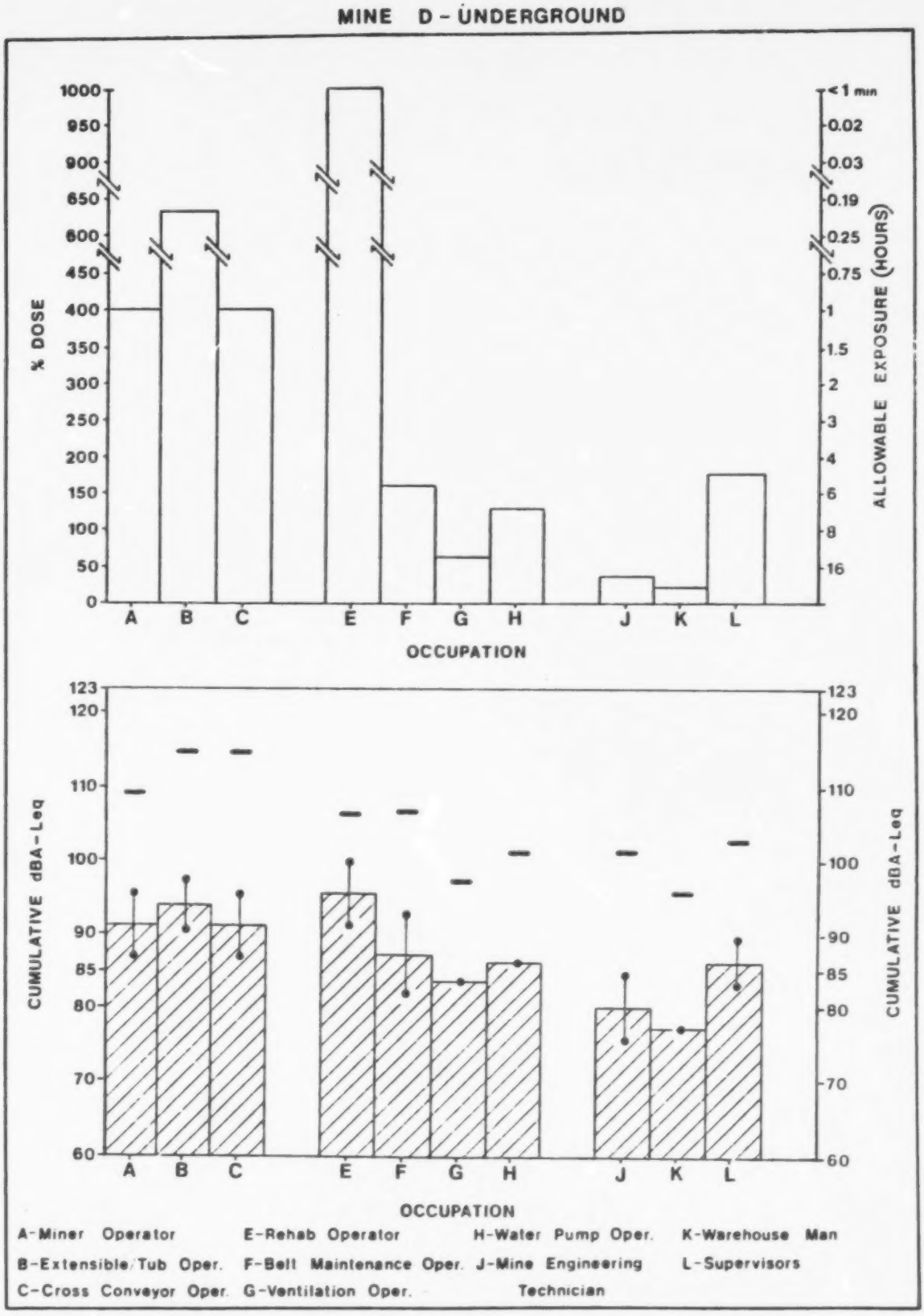

Fig. 8a - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine D.

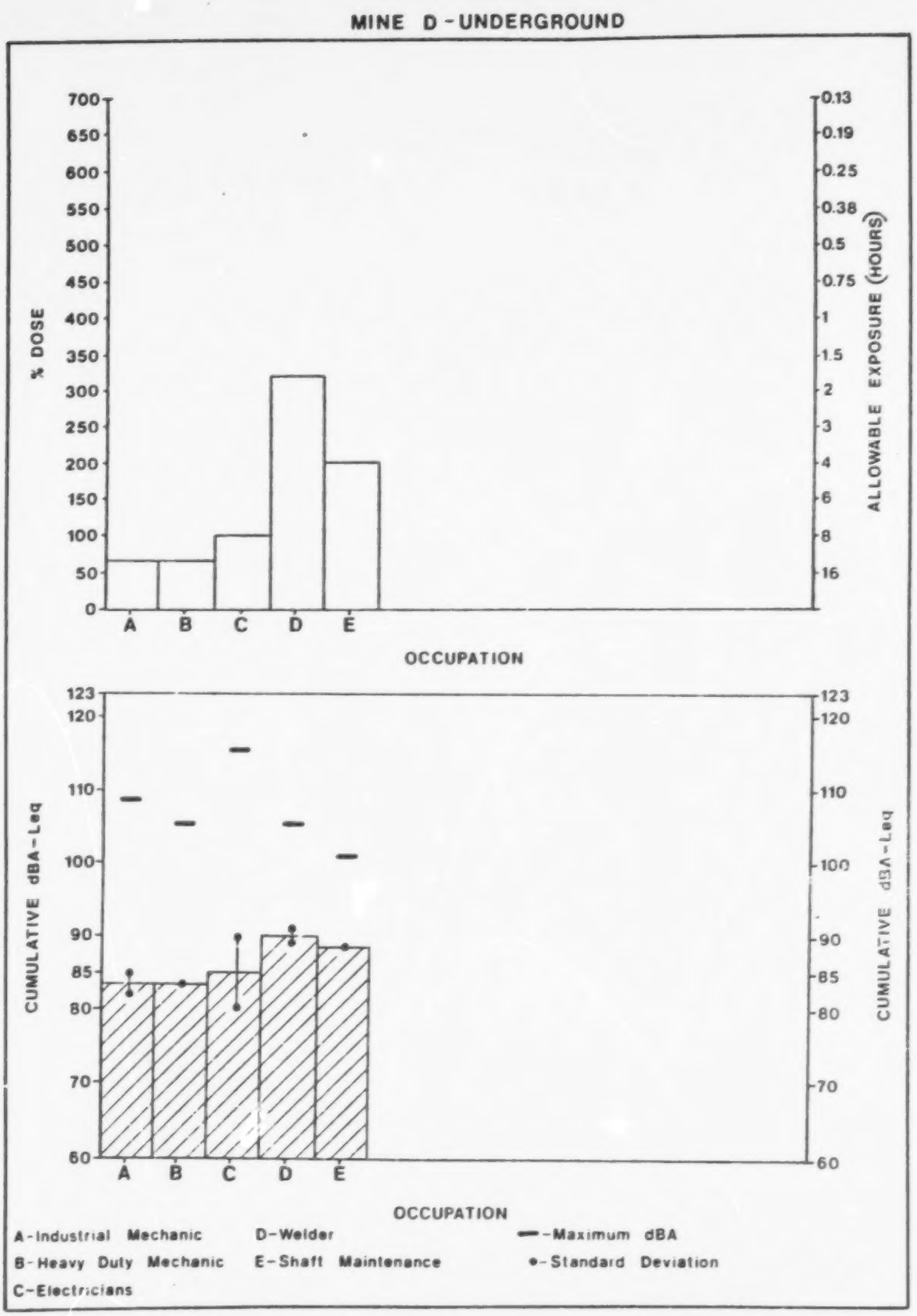

Fig. 8b - Comparison of cumulative dBA to percent dose/allowable exposure for each occupation underground at Mine D.

average, but the highest noise levels were found in occupations where only one or two samples were taken. Further testing would be required to validate these results.

CONCLUSION

The noise survey has reviewed the occupations throughout the various potash mines to determine their average cumulative level of noise exposure and recommends the following:

- further personal noise dosimetry testing should be conducted in order to produce data which include all occupations, with more frequent testing per occupation, for statistical accuracy;
- various types of noise measurements should be performed to efficiently analyze specific areas, in order to determine the most effective means of noise control;
- where there is any doubt about the noise level in a particular area, or for a specific occupation, an approved form of hearing protection should be worn;
- employees in job categories with higher exposure to noise could be given frequent audiometric tests by skilled technicians, and the results from these tests analyzed by qualified medical personnel;
- any changes, such as, new mining techniques, new equipment, renovation to existing work areas or construction of new work areas, could be done after determining if methods of noise control, and/or suppression can be feasibly incorporated with these changes;
- posted dBA readings, for surface and underground areas, should be periodically updated and these signs maintained and serviced so as to stress their importance to employees.

ACKNOWLEDGEMENTS

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